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THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTE OF BRITISH FOUNDRYMEN; THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION, AND THE FOUNDRY TRADES EQUIPMENT AND SUPPLIES ASSOCIATION.

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Forthcoming Events.

Institute of British Foundrymen.

APRIL 21.

Wales and Monmouth Branch:—Annual meeting at Cardiff. Lecture on "Practical Moulding in Loam, Green and Dry Sand," by A. Sutcliffe.

APRIL 28.

West Riding of Yorkshire Branch:—Annual general meeting at Bradford.

The Spanish Foundry Congress.

This extremely successful manifestation will probably result in the formation of a Spanish Foundry Technical Association. We envisage no difficulties, as the majority of the founders are already members of the Union Metallurgica—an important employers' federation. Our impression of the modern Spanish foundryman is that he is alive to all recent developments, but, as is the case elsewhere, lacks the necessary capital to achieve his objects. The prices he obtains for his castings seem reasonably good, but he complains of the competition of the small foundries. Moreover, it appears to be customary to sell by weight. There is plenty of opportunity for the sale of British raw material and machinery, and, in the case of the latter, weight is an important factor, as, we understand, customs duty is paid upon this, and not upon value. Moreover, we were assured that there is a distinct prejudice in favour of British machinery, though it is stated that German salesmanship is superior. At the exhibition, the only prominent British exhibit was one relating to electric heat-treatment furnaces.

It is pleasing to note that Dr. Everest's Paper on "Nickel in Cast Iron," was particularly well received, and the plain message that indiscriminate alloying was undesirable and retrograde was appreciated.

We feel sure that our Spanish friends would prefer us to be honest in our criticism of their castings, and will forgive us when we say that art castings apart, the quality of their castings is in general inferior to British. We insist, however, that with the present spirit of progress and inquiry abroad this state of affairs will be rapidly ameliorated.

The Spanish are not yet a great metallurgical nation—their annual coal production, for instance, only equals the British weekly output, but any visitor to Spain cannot help but feel that progress is being made and will continue. The splendidly-equipped and well-managed technical high school at Barcelona, with its 5,000 students, is a monument to both the enterprise and ambition of the modern Spaniard. It compares very favourably with our modern universities in the facilities available for the study of engineering subjects—especially foundry practice.

Finally, on behalf of the all too small British delegation, we wish sincerely to thank Col. Serrano and his committee, especially Mr. Espana, for the many courtesies and kindnesses shown to them, and for the genuine cordiality of their welcome and hospitality.

Does Industry Care.

Our attention has recently been called to a conference that is to be held during the summer under the auspices of an international organisation concerned with the betterment of human relations in industry. Truly, of the making of such organisations and the holding of such conferences there is no end. Sometimes they are held in England, and sometimes abroad; sometimes they are heralded with sounding of trumpets, and sometimes they creep upon us unawares; sometimes they are sponsored by weighty authorities and make for themselves extravagant claims, and sometimes they are modest to a fault. But very often they are concerned with industry—its conditions, it relations, its progress and so on.

And in the majority of cases they appear to lack the active co-operation of industry itself—as witness the fact that the conference referred to above sets out an imposing list of supporters that includes hardly a single representative industrial man.

Most of these activities do in fact begin life under the ægis of theoriests, academic economists, social reformers, and other outsiders, impartial and well-wishing enough, but who would probably make a sorry mess if they tried to run a business. As a consequence, they are all too often only distantly related to the facts of industrial experience, and seem unlikely to promise much in the way of practical solutions to industry's problems—although, in their several ways, they are being maintained out of the product of industry. And so the business man sets them impatiently on one side as unworthy of his attention and mere waste of time.

It is worth considering, in parentheses, whether in fact such outsiders may not occasionally "get a line" on industrial problems that industry itself need not despise, but that is a secondary consideration. The real danger in the aloof attitude adopted by industry itself lies elsewhere, and is much more formidable. For these activities may rapidly create an informed public opinion. Their meetings are reported in the Press, they circularise the public, they gain the interest of influential and distinguished people in various walks of life. Moreover, they make up in enthusiasm what they lack in experience. This public opinion develops without regard for the representative or unrepresentative character of the forces that are creating it, and sooner or later it will be strong enough to clamour for attention. In other words, a time will come when industry will find itself obliged to listen to the views of these organisations, even to act upon them—can it therefore afford to remain so indifferent?

Obviously not. The industrial man is free if he likes to get up and criticise their activities, declare their aims to be Utopian and their methods absurd. He need not necessarily adopt their tenets and support their views, need not even try to guide them along sound lines. But he simply cannot afford to ignore them. Movements for the improvement of industry will flourish whether industry supports them or not, and flourishing, will ultimately insist upon improving industry whether it likes or no; to ignore them is not merely dangerous, it is likely to prove fatal to future freedom of action and independence.

We have sufficient faith in the value of business experience to feel that if industry would express itself on the subject, or take part in these activities, or, alternatively, set up opposing activities, there would be an all-round gain.

XUM

An International Gathering.

A meeting of the International Committee of Foundry Technical Associations was held in Barcelona, Spain, on Friday, April 13. The President, Dr. Werner, of Düsseldorf, was unable to be present owing to illness, and Dr. Geilenkirchen, of Düsseldorf, was elected chairman of the meeting. The other delegates present were Messrs. Lamoureux, Belgium; Professor Portevin, France; Vanzetti, Italy; Professor Pishek, Czecho-Slovakia; Espana, Spain; V. Delport and Dr. Moldenke, United States; Langenohl, Germany; Professor Dresden, Holland; V. C. Faulkner, Great Britain; and T. Makemson (Great Britain), Secretary of the Committee.

After the formal adoption of the minutes, the Chairman welcomed into membership the newly-formed Dutch Foundry Technical Association. Professor Dresden acknowledged the welcome on behalf of the Dutch Association. The Secretary then presented the balance sheet for the year 1927, which showed a balance in hand at the end of the year of £17 7s. 5d.

Mr. V. C. Faulkner, Ex-President of the Institute of British Foundrymen and of the Foundry Trades' Equipment and Supply Association, then issued a formal invitation to all the countries represented to take part in the International Foundry Conference and Exhibition to be held in London in June, 1929. He assured the Committee that all visitors would be heartily received by their British colleagues, and several members of the Committee assured Mr. Faulkner of their interest and of the participation of the members of their respective Associations.

Considerable discussion took place upon the proposal to establish an International Dictionary of Foundry Terms. It appeared that the French Association was very anxious that this work should be carried out, and on behalf of the French Association detailed proposals were submitted. The French were strongly supported by the Belgian, Czecho-Slovakian and Dutch delegates. Mr. V. C. Faulkner stated that the Institute of British Foundrymen were not yet convinced that the proposed dictionary would be sufficiently valuable to justify the labour and expense which would be incurred, and this opinion was supported by Mr. Delport, on behalf of the American Foundrymen's Association. Professor Dresden and Mr. Lamoureux said that the dictionary would be of considerable value, particularly to students. Eventually it was decided to invite the various Associations to continue to collect information suitable for the dictionary, and also to endeavour to standardise foundry terms used in their own countries and to report progress at the next meeting of the Committee.

The President of the American Foundrymen's Association, who is Vice-President of the Committee for the present year, was elected President for the year 1929, and Ing.-Comm. Vanzetti, C.B.E., was elected Vice-President for the same year.

It was pointed out that the manuscripts for Exchange Papers were frequently received very late, and it was decided that an Association responsible for organising a conference at which Exchange Papers were expected, should inform the Associations giving the Exchange Papers of the date of the Conference as soon as it was fixed in order to give time for the Papers to be prepared.

In order to assist the Secretary of the International Committee it was agreed to invite the Secretary of the Association in whose country any given meeting of the Committee is held to collaborate with the Secretary of the Committee in connection with that particular meeting.

The next meeting of the Committee will be held in London in June, 1929, during the International Conference.

Foundry Pig-Iron.—In printing the article by Mr. Robert Fowler on "Foundry Pig-iron" in our issue of March 1 we regret that on page 154, under the heading of "Flux," on the fourth line, the chemical formula for the double carbonate of lime and magnesia (dolomite) reads $CaO.CO_2.MgOCO_2$. This of course should read, to be correct, $CaO.CO_2.MgO.CO_2$.

Iron and Steel Institute.

Programme of Annual Meeting, 1928.

Mr. G. C. Lloyd (Secretary) has issued the programme of the Annual Meeting of the Institute, to be held at the Institution of Civil Engineers, Great George Street, Westminster, on Thursday and Friday, May 3 and 4, 1928.

THURSDAY, MAY 3.

The General Meeting will open at 10 a.m., when the Annual Report and Statement of Accounts for 1927 will be presented. The newly elected President (Mr. B. Talbot) will then be inducted into the Chair, and following the presentation of the Bessemer Gold Medal to Mr. Charles M. Schwab, will deliver his Presidential Address on the History and latest Development of the Basic Open-hearth Process. Papers Nos. 2, 9, 15 and 7 (see appended list) will then be discussed till 1 p.m.

At 2.30 p.m. the Afternoon Session will commence when Papers Nos. 14, 8, 3, 12 and 16 will be discussed.

In the evening, at 7.30 p.m., the Annual Dinner of the Institute will be held in the Grand Hall, Connaught Rooms, Great Queen Street, W.C. (Tickets 12s. 6d. each, exclusive of wine).

FRIDAY, MAY 4.

At 10 a.m. the General Meeting will be resumed. An announcement of the award of the Andrew Carnegie Research Scholarships for 1928-9 will be made, and Papers Nos. 1, 5 and 6 will be discussed. In the Afternoon Session, at 2.30 p.m., Papers Nos. 13, 4, 17, 10 and 11 will be taken in the order named.

Papers to be Read at the Meeting.

(1) Second Report on "Heterogeneity of Steel Ingots," by a Committee of the Institute.

(2) "Blast-Furnace Data and their Correlation," by E. C. Evans and F. J. Bailey.

(3) "The Influence of Nickel in Iron-Carbon-Silicon Alloys containing Phosphorus," by A. B. Everest and D. Hanson.

(4) "A Study of the Resistance of Over-Stressed Wrought Irons and Carbon Steels to Salt-Water Corrosion," by J. Newton Friend.

(5) "A Comparison of the Most Important Methods Employed in the Cleaning of Blast-Furnace Gas," by V. Harbord.

(6) "Heat-Resisting Steels. Part II.—Mechanical Properties," by W. H. Hatfield.

(7) "Blast-Furnace Practice in Natal," by J. E. Holgate and R. R. F. Walton.

(8) "The Properties of Nickel Steels with Special Reference to the Influence of Manganese," by J. A. Jones.

(9) "Reactivity of Coke," by J. H. Jones, J. G. King, and F. S. Sinnatt.

(10) "The Recovery and Sinking-in or Piling-up of the Material in the Brinell Test and the Effects of these Factors on the Correlation of the Brinell with certain other Hardness Tests," by A. L. Norbury and T. Samuel.

(11) "Twin-like Crystals in Annealed Alpha-Iron," by H. O'Neill.

(12) "The Effect of Silicon on Tungsten Magnet Steel," by J. Swan.

(13) "Chromium Steel Rails," by T. Swinden and P. H. Johnson.

(14) "The Fatigue-resisting Properties of 0.17 per cent. Carbon Steel at Different Temperatures and at Different Mean Tensile Stresses," by H. J. Tapsell.

(15) "The New Plant of the Appleby Iron Company, Limited," by T. Thomson.

(16) "On the Structure of the Iron-Chromium-Carbon System," by A. Westgren, G. Phragmén and Tr. Negresco.

(17) "The Rapid Normalising of Overstrained Steel," by W. E. Woodward.

Annual Meeting at Bilbao.

As already announced, arrangements are in progress for holding the autumn meeting of the Institute at Bilbao, Spain. The main party will arrive on Saturday evening, September 22, and will spend Sunday, the 23rd, in San Sebastian. Monday will be spent in travelling by automobile from San Sebastian to Bilbao, and the meeting in that City will occupy the three days, Tuesday to Thursday, September 25 to 27. Extended excursions will afterwards be made to Burgos, Madrid, Toledo, Sagunto, Cordova and Seville.

Random Shots.

A good deal of comment has been aroused by the distinct signs of a boom on the Stock Exchange just before Easter, and still more by its maintenance after the holiday. But the full significance of the fact has not been sufficiently stressed. Every investigator in the realm of trade fluctuations is agreed that financial activity precedes industrial activity; many would go further and say that such financial activity is a sure precursor of industrial prosperity to come. It has been clearly shown, for instance, by one set of figures compiled in the United States, that such a relation has existed there for many years, the condition of industry echoing the condition of finance at a regular interval of six months.

* * *

It would, of course, be going too far to apply this experience wholesale to our own country and the present situation, and to prophesy a period of intense trade activity for the autumn. But it will be in the highest degree interesting and instructive to see how far events bear out the reasonable anticipations of many well-informed men.

* * *

Talking of the United States, several excellent stories attributed to the late Chauncey Depew have recently been put into circulation. Here are two on the good old topic of Chicago. A rich Chicago merchant died, and was being shown over the next world by an official guide. "Dear me," the merchant said, "I had no idea heaven was so like Chicago." "This," said the official, grimly, "is not heaven."

* * *

And the second. A quarrel was in progress in the nether regions, and a group from Chicago were taking a prominent share. A New Yorker reproved them severely. "You Chicago men," he said, "think you're the only people in hell, but you're not; you're only the most numerous."

* * *

And, incidentally—while the Chicago elections are still fresh in our minds—what of the highly-respectable and sedate London daily that announced the results beneath a flaring headline to this effect: "Only One Murder in Chicago Elections!" Surely a biting commentary on the current English opinion of American affairs!

* * *

I am still hearing echoes of my recent collection of tales about Paris restaurants, and one such echo has brought me the following. I understand—and believe—that it actually happened, although I feel bound to confess that it reached me only at second hand. It concerns a lady, no longer in the first bloom of youth, who felt herself to have reached that stage in life at which solitary rambles in Paris hold no terrors for the female of the species. She accordingly decided to patronise one of the larger and more popular cafés on the "Grands Boulevards," took a seat therein, and began to study the bill of fare. A waiter, bustling up, inquired discreetly if she were alone. Wholly engrossed in her study, and possessing but indifferent French, she replied, "Non, mais je cherche"—which may well be interpreted as meaning, "No, I'm on the look-out!" It is at least comforting to learn that the lady had sufficient sense of humour to enjoy the joke when she saw it!

The Poets on the Problems of Founding:—

"Here are sands, ignoble things!"

(Beaumont.)

* * *

And here is another north-country story, this time to illustrate the thrift rather than the conservatism of that region. A very recent widow was descanting on the trials of her state and the firmness of her behaviour therein. "He deed," she said, "yesterday mornin', an' Aw sent for th' barber to shave him, an' he ses 'Dun yo' know how much it'll be?' an' Aw ses 'Naw,' an' he ses 'It'll be hauve a crown,' an' Aw ses 'Durn't bother, then, he's gooin' nowhere particular.'"

Marksman.

Foundry Purchasing.—XXV.

By Eric N. Simons.

Any order form, whatever the goods with which it deals or the industry for which it is designed, must do the following things:—(1) Indicate the conditions on which the order is placed: (2) indicate the terms of payment expected: (3) indicate the way in which the goods are consigned: (4) indicate the procedure to be followed by the supplier in making out invoices and advice notes: (5) indicate the reference number or department to be quoted in all correspondence connected with the order: (6) indicate clearly the name and address of the purchaser, and if the offices are separate from the works, or both in the same place: (7) indicate the telegraphic address and telephone number, if any, of the purchaser, and codes used for cabling purposes: and (8) provide a space for the official signature of the firm and the buyer.

The Main Point in Ordering.

The great desideratum in ordering is not so much to design a form embodying these requirements in a simple and economical way, as to see that the supplier is provided with all the information necessary for proper execution. The character and extent of the buyer's needs should be given clearly, unmistakably, and briefly, in the order. Where a particular specification, standard or private must be complied with, the reference number and date of this should be given, and if there is any doubt as to the supplier's possession of a copy of the specification in question, it is better to send him a copy with the order, time in correspondence being thereby saved. Similarly, any drawings, blue prints, tracings, sketches, and so forth, or samples, must be sent with the order. The statistical clerk should have among his numerous records information regarding the correct description for every class of goods. This correct description should be used, because only thus can error and confusion, or the alternative of correspondence that delays delivery, be avoided. It will readily be seen that a loose description of the goods might involve the supplier in considerable perplexity, since if he had several grades of a particular material, he might not know to which grade the order referred. For example, an order for "one bar of steel for lathe tools" would puzzle a steel manufacturer if this were all the information supplied to him, since some steel manufacturers make as many as ten or a dozen different kinds of steel that might all be used for lathe tools, their choice being governed by the kind of work required of them.

Acknowledgment of Orders.

It is necessary that every order sent out should be formally acknowledged. Otherwise the buying department has no certainty that it has reached its destination, and a loophole is left for any not too scrupulous supplier to explain delays in delivery by delays on the part of the postal authorities in delivering the order. An acknowledgment pointing out the date on which the order was received puts any such excuse out of court. Some firms adopt the policy of making an acknowledgment slip part of their order itself, separated from it only by a line of perforations, and instruct the recipient to return this filled in as soon as the order is received. Those familiar with the actual handling of orders after their receipt will understand why this is unsatisfactory. It often happens that the order has to pass through several hands before it reaches the order clerk, whose task is to fill up and detach the slip so that by the time it reaches him, the slip has either been torn off, or it seems to him that too long a time has elapsed for a formal acknowledgment to be worth sending, so he ignores it. Businesslike firms have their own specially printed acknowledgment cards; but if the buyer wishes to make certain of receiving an official intimation that the order has reached its destination, it is better for him to enclose an addressed postcard for immediate return.

Design of Order Form.

Earlier an example of modern methods of dealing with orders was given. The number of copies taken depends, of course, on the organisation in existence at any particular place. As a general rule, a copy is sent to the requisitioning department, another is filed in the buying department, and the original is sent to the supplier. Some firms also send copies to their storekeeper and to their cashier or accountant. It is an advantage to have the various copies coloured distinctively, to avoid any error in sorting, since information may be given on the copy for one department that should not appear on the copy sent to another. It is also better to have the order forms bound together in separate sets, *i.e.*, one original and however many copies are required. In this way carbons can be readily inserted, and the order and its copies typed at one operation, each order being thus handled separately. Registering of the copies is thus rendered automatic, which facilitates reference. When the order is completed, the copies are detached by means of perforations, and as they are supplied with holes to fit them for standard binders, they can readily be bound up for permanent retention in loose-leaf leather-backed binders. When a binder is full, its contents can be taken out and filed in a file box, the binder being used again for current sheets. This represents a great economy as compared with the old system of order books, in which all the forms were bound in a book, the originals being torn out when completed, and the book of duplicates being filed when finished with. Orders had to be written out by hand, whereas the newer plan enables them to be typewritten, time being saved in no small measure as a result. Instead, also, of having to order expensive books each time, the buyer need only order the batches of sheets, and his binder, if strongly made, will last a lifetime, simple file boxes being adequate for the retention of old forms.

Where to Place the Order Number.

The order-number should always be placed at the right-hand top corner of the form, because this facilitates reference, giving the number a more prominent position than it would otherwise have. There is no need to be timid about the size of the reference letters and numerals. The bigger and bolder these are the less likely is there to be a mistake in quoting them. A useful plan is to have a few unnumbered sets of order sheets printed, so that if by chance a particular order sheet is spoiled, it can be replaced without interfering with the consecutive numbering. If any details typed on to the original (e.g., prices) must not appear on the copies, they should be omitted at the first typing and filled in on the proper single sheets afterwards. It is essential, especially where orders are typewritten, to have them all scrupulously examined for errors or omissions before despatch. It is easy for a slip to be made in quantities or dates of delivery that, if undetected, may necessitate protracted correspondence or cause unrivalled confusion.

There are differences of opinion as to what should happen to the copies of orders retained by the buying department. But before these are discussed, it will be as well to indicate the remaining steps in procedure. The despatch of the original order to its destination is the signal for the sending out of the departmental copies. (Here one might interpolate a suggestion that the envelopes for orders should be written out in the buying department itself, and for preference the orders be enclosed in the same department. In this way the ludicrous and painful accident of one firm getting a competitor's order, owing to a postal department's error, will be avoided. This sort of thing "lets the cat out of the bag" with a vengeance.) There remain in the buying department's hands the original requisition and the copy of the order. The requisition should be marked with the order reference number, and filed away in whatever manner may best suit the buyer's convenience. The order copy should have the requisition reference number noted down on it, so that no delay takes place should examination of the requisition be necessary.

Some buyers—and here one comes to the point of controversy referred to earlier—file all order copies consecutively in a binder of the kind indicated, and for their reminder records rely on forms. This seems to the writer the more satisfactory method, since it lessens the likelihood of order copies getting lost or mislaid, and in the event of some departmental manager wishing to refer to a particular order he can do so without having to hunt helter-skelter through some absent buying-department official's file of papers. The alternative plan is to file only those orders that have been executed, retaining the uncompleted orders.

It is necessary, if the latter procedure is adopted, to provide space on the copy for the enumeration of delivery details, so that the official concerned may see how quickly matters stand in this respect. But, as has been said, the first method is by far the better in the long run. It keeps the records in better condition, is more convenient, and equally effective in practice.

The necessity to post up the statistical records from the order copies must not be overlooked.

Annual Meeting of the German Foundrymen's Technical Association.

The 18th ordinary general meeting of this Association is to be held in Berlin on May 5 and 6, when the following Papers are to be submitted:—

(1) "Foundry Practice for Grey Iron," by Director J. Petin, Hanover.

(2) "The Use of Steel Castings Compared with Grey and Malleable Castings," by Director Fr. Herkenrath, Bonn.

(3) "Special Types of Construction and Special Methods of Working of Cupolas," by Dip.-Eng. L. Schmid, Wannsee.

(4) "The Present Position of X-ray Testing and its Usefulness for Examining Castings," by Prof. Dr.-Eng. M. Baron von Schwarz, Munich.

(5) "Psychology and Economic Working," by Prof. Dr. Horneffer, Giessen.

The programme of the meeting will also include visits to the following:—(1) Super-Power Station Klingenberg at Berlin-Rummelsberg: (2) the foundry of the Hartung Company at Berlin-Litchtenberg: and (3) the State Porcelain Factory.

Those intending to be present at the general meeting should notify Die Geschäftsstelle des Vereins Deutscher Giesserei Tachleute, 100, Friedrich Strasse, Berlin, N.W.7.

In connection with the general meeting there will be given again this year a course of lectures at the Technical High School for Metal Foundry Practice extending over a week from May 7 to 12. The course is arranged with the Annexe Institute of the Technical High School in Berlin in conjunction with the German Foundrymen's Association, the Collective Union of German Metal Foundries, and the German Institute of Metals. Notification should also be made to the Geschäftsstelle, Berlin, by those visitors wishing to attend these lectures.

Steel Houses in Germany.—To meet the increasing demand for steel houses throughout Germany, the Vereinigte Stahlwerke A.G. has founded a new company, the Stahlhaus-Baugesellschaft m. b. H., with headquarters at Duisburg, for the production of fabricated steel houses. The present capacity of the new company is set at about 1,500 houses per annum, but as the demand is already considerably in excess of that figure, production is to be increased. The new organisation is associated with the Bamag-Meguin, the Berlinische Baugesellschaft and the Gebrüder Achenbach (Weidenau) for the marketing of its product. The Rheinstahl concern has published estimates for three sizes of houses (8 m. by 8 m., 8 m. by 9.5 m. and 8 m. by 12 m. respectively in plan), the costs of which are given as 6,900 mks., 8,460 mks. and 9,780 mks. respectively, exclusive of land and payments for roads.

Nickel in Cast Iron.*

By Arthur B. Everest, Ph.D., B.Sc.

(*Continued from page 258.*)

Microstructure.

Nickel does not appear to have any very marked influence on the graphite form in these specimens. The low silicon is effective in the production of fine graphite initially, and nickel additions appear to maintain this fine form. With low silicon nickel-irons a very dense structure is obtained, and the specimens in most cases showed a marked absence of pinholes on the polished surfaces.

All specimens were pearlitic, and in all cases the pearlite was finer in the 2 per cent. nickel alloy than in the 1 per cent. A typical example of this is shown in Figs. 6 and 7, these being photomicrographs of specimens A41 and A42 containing 1 and 2 per cent. of nickel added respectively (Si = 0.9). The general structure of these specimens is shown in Figs. 4 and 5.

A similar gradual refinement of the general structure is seen in Series 3 (silicon 1.1 per cent). In these specimens the absence of coarse pearlite knots, containing probably excess carbide, was noticeable in the higher nickel specimens.

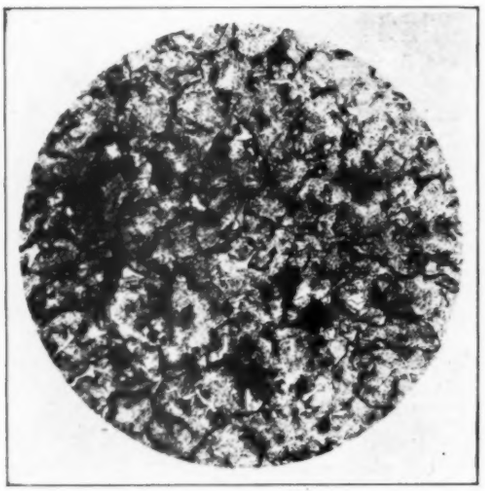

Fig. 4.—Ni, 1 per cent.

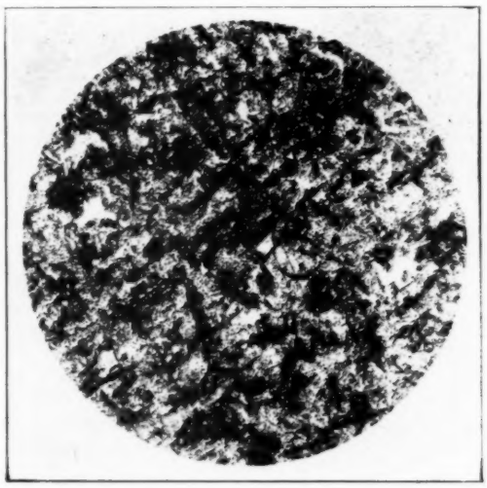

Fig. 5.—Ni, 1.8 per cent.

Fig. 6.—Ni, 1 per cent.

Fig. 7.—Ni, 1.8 per cent.

Experimental Cupola Test.

The crucible tests described above indicated roughly the following composition of iron as suitable for further experimental work:—

	Per Cent.
Total Carbon	3.2
Silicon	1.2
Manganese	0.6
Phosphorus	0.2
Nickel	1.0 or 2

and consequently in the next stage of the research, experiments were made on the production of iron of this composition by the addition of nickel to a cupola-melted base, thus bringing the test more into line with current industrial practice.

In the first place a trial run was made from a small experimental cupola, melting about 1 to 1½ tons of iron per hour. The charge was calculated to give metal at the cupola tap-hole containing carbon about 3.2 per cent., Si 1.2, Mn 0.8, and P 0.132 per cent. However, it was found that the working of such a cupola was liable to give somewhat irregular results, and was not comparable to the working of a larger furnace. The carbon absorption was higher than that calculated, probably owing to the abnormally low silicon-content of the iron.

Test bars were cast from this metal with 1 and 2 per cent. of nickel added, and hardness and chill tests were taken on the same, and also on the base iron with no nickel.

The analyses of these test bars are given in Table VIII.

The test results obtained are given in Table IX.

* A Paper presented on behalf of the Institute of British Foundrymen to the European Foundry Congress held in Barcelona.

Table VIII.—*Composition of Small Cupola-Melted Nickel Cast Iron.*

	Test Bars.	
	B 11	B 12
T.C.	3.38	3.43
C.C.	0.90	1.01
Gr	2.48	2.42
Si	1.29	1.35
Mn	0.65	0.72
S	0.096	0.097
P	0.116	0.110
Ni	0.93	1.84

1 and 2 per cent. of nickel. These were broken up for examination. The cylinder walls in each case showed a fine, dense fracture. On the water-cooled block the cylinder-bore showed a mean Brinell hardness of 213.

Microscopic examination of the cylinder walls of the air-cooled blocks showed that the graphite was evenly distributed and in moderately fine flakes. The iron in each case was pearlitic, showing a fine laminated structure. This is illustrated in Fig. 8, which shows the pearlite in the 1 per cent. nickel iron.

A similar pearlite structure was seen in the cylinder walls of the water-cooled block, but in the base of the block, and in the bosses for the valve-guides where more rapid cooling conditions prevail than do in the cylinder walls, a very fine form of pearlite was found which would probably give very good-wearing properties (*c.f.* (17)). This structure is illustrated in Fig. 9.

On the whole, the cylinder castings showed a slight tendency to be undesirably hard on the corners, and it was felt desirable for further work to use a somewhat higher silicon content in the base iron.

Fig. 8.—Ni, 1 per cent.

Fig. 9.—Ni, 1 per cent.

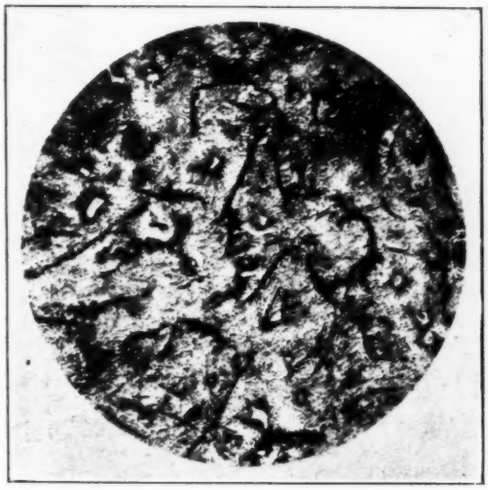

Fig. 10.—Ni, 1 per cent.

Fig. 11.—Ni, 1 per cent.

Examination of these results shows that the iron is of very good quality, the tensile strength on the small bar, and also the result of the repeated impact test (which was carried out as described under the crucible melted tests above) being especially good. The effect of nickel in reducing chill is again emphasised, not only by the depth of chill figures given but also by the hardness figures obtained on the small sections of the step castings.

Some air-cooled cylinders and small water-cooled blocks were cast of this metal containing

Further Cupola Tests.

The results of the test on the experimental cupola were so satisfactory, bearing in mind the limitations met in using so small a furnace, that further tests were planned, using a normal works cupola for melting the base iron, thus bringing the experiments on to the level of ordinary industrial practice.

These tests are as yet incomplete, and a comprehensive examination of the properties of the nickel cast iron produced in this work is yet in hand, and will be reported later. It may be stated, however, that as a result of further tests, it has been found desirable to work on a silicon content of 1.5 per cent. in a 1 per cent. nickel iron.

In a test recently made giving iron of the following composition:—T.C., 3.20; C.C., 0.64; Gr., 2.56; Si., 1.44; Mn., 0.91; S., 0.108; P., 0.17, and Ni., 1.12 per cent., very good mechanical properties were obtained. In transverse test a maximum stress of 28.42 cwt. was shown, giving a modulus of rupture of 37.6 tons per sq. in., associated with a deflection of 0.329 in. In tensile tests on small bars cast ¾ in. dia., a mean breaking load of

24 tons per sq. in. was obtained, and of 20.5 tons per sq. in. on bars cast 1.2 in. dia.

Motor-engine blocks, which gave especial difficulty in casting owing to the heavy section of

Table IX.—*Results obtained from the Bars Detailed in Table VIII.*

		B 10	B 11	B 12
Depth of chill (mm.)		50	10	5
Transverse.	Max. stress. Cwt.	—	26.6	28.0
	Deflection. Inch..	—	0.34	0.35
	Modulus of rupture	—	35.3	37.4
	Tons/sq. in. ..	—	—	—
Tensile.	Max. stress. Tons/sq.in.	—	—	—
	On 1.2 in. dia. bar ..	—	16.84	16.70
	On 0.75 in. dia. bar ..	—	19.70	20.80
Repeated impact.	Blows ..	—	1,196	1,310
Brinell hardness.	1 in. sect. ..	228	212	225
	½ in. ,, ..	250	228	241
	¼ in. ,, ..	364	242	251
	⅛ in. ,, ..	340	251	286

the cylinder wall (0.55 in. thick) and the mass of jacketing around it, were cast in this iron. The metal showed a grey fracture even in most sections of the water jacket (3/16 in. thick), yet the cylinder wall gave a hardness figure of 215 Brinell, which is remarkably hard for this casting. There were traces of hard spots on the corners and edges of the castings, but these were not serious enough to cause inconvenience in machining.

Microscopic examination of the cylinder wall shows that the graphite is fine and evenly distributed. The general structure of the iron is shown in Fig. 10, which shows also the phosphide constituent to be fine and evenly distributed. The matrix of the iron is pearlitic with small areas of ferrite locally. The pearlite is in a very fine form as shown in Fig. 11. It is anticipated that this iron will give good results in service, and will mark a definite advance in the development of high-duty iron for automobile engines.

Conclusion.

It has been shown in this Paper that the author's experiments made by adding nickel to English cast iron have given results similar to those obtained by other workers in other countries, and that under certain conditions exceptional and undoubtedly good properties may be obtained by the use of nickel as an alloy addition to cast iron. It is clearly demonstrated, however, that in order to obtain the most beneficial effects of nickel in cast iron, it is necessary to use as basis of the alloy, iron of suitably controlled composition, the carbon content must be normal, and the silicon content lowered to compensate for the graphitising action of the nickel added.

Given a base iron of suitable composition, it has been demonstrated that the nickel alloy has:—

(1) Reduced tendency to the effects of chilling, thereby giving improved overall machinability.

(2) Improved mechanical strength without impairing the elasticity, as shown by the deflection figures obtained in the traverse test, due in part to the fine grain in these irons.

(3) Increased hardness in heavy sections, accompanied by a slight increase in drill hardness.

(4) Improved resistance to repeated impact.

(5) A fine form of pearlite, which will probably give improved resistance to wear.

Also, it is found that although nickel will not appreciably improve iron of unsuitable composition, nevertheless, it has no deleterious effect, so that trouble need not be anticipated by the introduction of nickel into ordinary mixtures through the accidental use of nickel iron scrap.

The author wishes gratefully to acknowledge the very generous assistance of Mr. P. Pritchard, and also of Mr. T. W. Picken, both of the Midland Motor Cylinder Company, Smethwick; of Mr. F. O. Everard, of Messrs. Belliss & Morcom, Limited, Birmingham; and of Messrs. C. & B. Smith, Wolverhampton; in making the experimental castings used for the tests reported in this paper.

He also wishes to express his appreciation of the helpful co-operation of the British Cast Iron Research Association, through its Nickel Committee, and especially to thank Mr. J. G. Pearce, B.Sc., Director of Research, for chemical analyses, and the repeated impact test results; also Mr. S. E. Dawson, Chairman of the Nickel Committee.

Finally, he wishes to record grateful thanks to Professor D. Hanson, D.Sc., head of the Metallurgical Department of the University of Birmingham, for his constant assistance and interest; and also to Mr. T. H. Turner, M.Sc., of the same Department, for valued assistance in the review section of the work.

REFERENCES.

[1] "On the Effect of Nickel and Chromium on the Strength Properties of Grey Cast Iron." E. Piwowarsky. Found. Trade J., 1927/36/4 & 37.
[2] S. S. Hickling. Brit. Pat. 2296/1799.
[3] M. S. Poole. Brit. Pat. 10971/1845.
[4] "Nickel in Cast Iron." L. Guillet. Compt. Rend. 1907/145/552.
[5] "Improvement of Cast Iron by the Addition of Alloy Metals." E. Piwowarsky. Stahl u. Eisen, 1925/45/289.
[6] "Influence of Nickel and Cobalt on Cast Iron." O. Bauer and E. Piwowarsky. Stahl u. Eisen, 1920/40/1300.
[7] "Refining Cast Iron by Adding Nickel." E. Piwowarsky and E. Ebbefeld. Stahl u. Eisen, 1923/43/967.
[8] "Low Temperature Heat Treatment of Special Cast Irons." J. W. Donaldson. Found. Trade J., 1925/31/517.
[9] "Influence of Special Elements on Grey Cast Iron." J. W. Donaldson. Found. Trade J., 1925/32/553.
[10] "High Temperature Growth of Special Cast Irons." J. H. Andrew & H. Hyman. J. Iron & Steel Inst., 1924/1/451.
[11] "The Influence of Nickel and Silicon on an Iron Carbon Alloy." A. B. Everest, T. H. Turner & D. Hanson. J. Iron & Steel Inst., 1927/II/185.
[12] "Use of Nickel in American Iron Foundries." J. Galibourg. L'Usine, Apl., 1927, p. 26.
[13] "Cast Iron Alloyed with Nickel." P. D. Merica. Foundry, 1924/52/131.
[14] "Nickeliferous Cast Iron." P. D. Merica. Iron Steel, Canada, 1925/8/86.
[15] "Nickel and Nickel Chromium in Cast Iron." T. H. Wickenden & J. S. Vanick. Amer. Found. Assoc., 1925/33/347.
[16] "The Economic Value of Nickel and Chromium in Grey Iron Castings." D. M. Houston. Trans. Amer. Soc. Steel Treating, Jan., 1928. 13/1/105.
[17] "Data on Machinability and Wear of Cast Iron." T. H. Wickenden. Soc. Auto Engineers, U.S.A., Jan., 1928.
[18] "Nickel and Nickel-Chromium in Cast Iron." A. B. Everest. B.C.I.R.A. Bull., 16/14 & 19/7. Also Bureau of Information on Nickel (London), Paper B2.
[19] "Non-Magnetic Cast Iron." S. E. Dawson. Found. Trade J., 1924/29/439.

Yorkshire Foundrymen Visit Machine Tool Works.

The March meeting of the West Riding of Yorkshire Branch of the Institute of British Foundrymen was an occasion of double interest, in that it provided a works visit of great general educational value, which was followed by an open meeting, the chief feature of which was a discussion on the subject of sponginess on the upper surface of iron castings.

The visit was to the extensive engineering works of Messrs. Wm. Asquith, Limited, High-road Well Works, Halifax. The members gathered at the works in the afternoon, to the number of over 40, for a tour of the various shops. Messrs. Asquith are specialists in the making of high-speed power-driven drilling machines, and inventors of the well-known "Central Thrust" radials and rigid verticals. The visitors were shown, in the making and completed, the firm's high-speed light-type radial drilling, boring, tapping and studding machines for light work, their radial machines of medium type for heavier work, their central thrust machines for heavy duty, and their extra heavy-type machines designed for exceptionally heavy duty. Many parts and accessories were examined with interest. The chief place of attention for the visitors, of course, was the firm's up-to-date foundry, where they have complete equipment to undertake the casting work needed in their product of machines and parts.

Mr. Herbert Dennis, works manager, was, unfortunately, unable to be present to receive the visitors, but they were welcomed on behalf of the directors by Mr. George Hoyle (assistant works manager), and the party was then divided into small groups and conducted over the extensive plant by Mr. Hoyle and by Messrs. H. Slade, W. Hannaby and V. Greenwood, members of the staff.

At the conclusion of the tour, Mr. W. Parker (Sheffield), Branch-President, proposed a hearty vote of thanks to the directors of Messrs. Asquith and Mr. Dennis for their kindness in offering facilities for the visit, and to Mr. Hoyle and the staff for the interesting manner in which they had explained processes and details on construction and working of the machines in the course of the tour of the works. Mr. Parker said the guides had shown and explained everything very frankly, including the latest device, the firm had put on the market, namely, their pulveriser. It was clear that the works were run on highly efficient lines, and the engineering world knew how efficient were the Asquith products.

The Proposed "Safety First" Regulation

Mr. W. Slingsby, of Keighley, supporting the thanks, said the visitors had been shown many interesting things which the firm had done and had tried to do, both in the engineering side and in the foundry. It was to the advantage of every foundryman to attend such gatherings as that, and became *au fait* with all phases of his craft. Mr. Slingsby said there were many problems facing foundrymen to-day, both from the practical standpoint in daily work and from outside influences. An instance of the latter was the new draft regulations that had been issued recently in regard to factories, in which it was stated that a foundry employing 50 men or more must have a whole-time paid official whose sole duty was "safety first." Speaking as one who had gone through the foundry trade from workman to employer, during a working lifetime, he felt from his own experience that this was a piece of legislation which was likely to cause much trouble. It was not fair that an industry which was struggling against adversity, as was the foundry trade at present, should be harassed by grandmotherly legislation such as this demand that firms who were having no little difficulty in paying their way should be saddled with an extra burden of some 3 per cent. on the wage bill for a man to walk round and see that if a man dropped a hammer nobody should fall over it. (Laughter.) It was not as though the foundry trade was one with a mass of intricate and crowded machinery requiring guards and constant watchfulness against moving parts. He (Mr. Slingsby) could not imagine what such an official would do with most of his time in the average foundry. Was it necessary to have a paid official to tell foundrymen to get out of the way if there was a burst? (Laughter.) Such legislation did not emanate from anybody in the trade, either employer or employed, and it was high time the country put a stop to these constant interferences with trade by grandmotherly legislation which was not required, and which particularly was undesirable in a time when industries were having a severe struggle for existence. (Hear, hear.)

Mr. Hoyle, replying to the vote of thanks, said the firm were pleased to be able to show the visitors anything that might be of interest, and so far as he and his colleagues of the staff were concerned, they were glad enough of opportunities of similar information at times, and it was a pleasure to do their little bit to help the visitors.

The party then adjourned to the Golden Lion Hotel, opposite the works, for dinner.

At a subsequent meeting, held at the hotel, Mr. H. Sayers, of Leeds (Vice-President), presided, as Mr. Parker was called back to Sheffield by telephone owing to sudden illness in the family. The members expressed their sympathy and good wishes to Mr. Parker.

The Council of the Branch, at a brief meeting prior to the general meeting, instructed the Hon. Secretary (Mr. S. W. Wise, of Bradford) to send condolences to the relatives of the late Mr. E. Thompson, of Bradford, a member of the Branch.

On the recommendation of the Council, the general meeting agreed that the Branch summer excursion should be a pleasure outing entirely, to Ripon and Fountains Abbey, on June 9, and should be open to ladies.

Mr. J. Butterworth, of Halifax, had prepared a Paper under the title, "Some Causes of Sponginess on the Upper Surface of Iron Castings." Owing to the shortness of time and the desirability of a full discussion and exchange of experiences, the Paper, with Mr. Butterworth's consent, was given to the meeting, in a condensed form, by Mr. W. H. Poole (Keighley).

Chilled Iron Rolls.

By Archibald Allison (Sheffield).

(*Continued from page* 261.)

METALLURGICAL OPERATIONS.

The rolls described in this paper were mostly from 7 cwts. to 14 cwts., but occasionally rolls of 4 cwts. and over 30 cwts. were cast.

For the purpose of casting chilled rolls with correct depth of chill, it is necessary to produce the requisite volume of molten iron, either in furnace or ladle, and ascertain the chill as exactly as possible whilst still retaining the metal hot enough for casting. Since it is impossible to increase chill on metal in the ladle, it is more practical to arrange the composition to produce iron somewhat whiter than required. The readily-available grey iron always at hand from the cupola is then added in measured quantity so that the chill is reduced by the more silicious addition.

For reasons given below, it was found to be more satisfactory to produce the necessary volume of liquid iron by synchronising the oil furnace and cupola to supply melts to form a joint mixture. The conjunction of the oil-fired furnace with the cupola supplies the following resources:—

(1) Worn out rolls may be charged whole into the oil furnace, and melted down with suitable additions of pig-iron. The metal may be sampled for chill test, and corrected suitably by additions of low-silicon iron to increase chill, or high-silicon iron to reduce chill, and the metal then tapped and cast.

(2) To produce larger volumes of metal, cupola and oil-furnace melts may be mixed in one ladle. Also by additions of steel scrap to the oil-furnace mixture lower carbon cast iron may be thus produced in bulk.

(3) Steel scrap may be heated on the hearth, and additions of molten iron from the cupola poured in to form a bath of the desired quality.

(4) After making a casting, metal remaining in the ladle may be poured into the furnace on to the steel scrap and alloys already charged, and further additions of cupola metal made as desired.

(5) Metal found to be too cool in the ladle for correct casting can be poured back into the oil furnace for further heating with very little change in quality. It may be mentioned that metal for a low-carbon iron casting was tapped and found to be too cool for the rather important casting in process of manufacture. After cleaning the slag from the ladle the metal was poured back for half an hour. Both furnace and ladle were therefore cleared of slag, and whether this was the reason or not, the resulting casting was particularly clean.

(6) To obtain accuracy of chill it is possible to tap out, mix thoroughly in the ladle, take chill test, and, if necessary, pour back into the furnace, for further heating or mixing with other metal.

More exact control of chemical composition in the molten iron is possible, especially as regards carbon, by varying the oil furnace charge.

Normal Operations.

Normally the use of the oil furnace was to melt down old rolls with suitable modifying irons. The bath was then tested for chill, and since it was usually arranged that the chill indicated should be deeper than required on the rolls, after tapping, measured quantities of grey iron were added in the proportions indicated by experience.

Notwithstanding that the working of the oil furnace was carefully regulated by water gauges on the blast pipes by which the oil was blown into the furnace, there was found to be sufficient variation in the oxidation of the melts to upset calculations as regards depth of chill, unless care was taken to allow for certain factors. Such variables detected were the greater oxidation with light

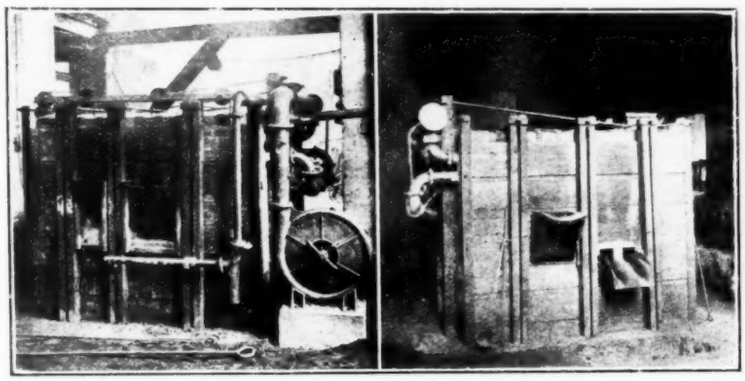

Fig. 2. Front and back views of the Oil Furnace.

than with heavy scrap, and also when steel was introduced with the cold charge. Secondly, the proportions of the first and second charges. Since three quarters of each melt was charged first and the remainder when this was melted, oxidation loss was to some extent avoided by reserving the more manganiferous and silicious portions for the second charge.

How Steel is Added.

When mild steel entered into the mixture, this portion was kept back and charged into the liquid bath, because the steel rapidly oxidised before there was sufficient molten iron to dissolve it. It was found that if half an hour intervened before tapping, the metal would gain $\frac{1}{8}$ in. chill by oxidation in the furnace, and this factor was occasionally utilised if the chill was insufficient on the test-piece.

Whilst a ladle-test is always desirable, the fifteen minutes' waiting for satisfactory completion of cooling the test-piece sometimes resulted in cold metal; therefore, particularly with metal for lower carbon rolls, the plan was adopted of taking a bath sample and, if satisfactory, of taking a further bath sample, and tapping five minutes later. Thus the piece was given a start in cooling, and the test completed before the metal cooled seriously; further, the second piece was a check on the first.

"Letting Down" Irons.

Variable results being obtained from using the shop iron for reducing the chill, it became necessary to charge a small mixture of known irons for "letting down" purposes. In this way, a small ladle or shank was used as a measure, holding about 1¼ cwts. molten iron, and this quantity on a 34 cwts. melt would reduce chill by ¼ in., and with other quantities in proportion. The "letting down" iron was charged to yield a metal with silicon approximately 2 per cent. and manganese 0.6 per cent. The metal in the ladle being suitably corrected, it was then thoroughly mixed and a final chill test-piece cast for record purposes.

The temperature was next recorded; to wait a few minutes if too high, to hasten if cool and the metal cast into rolls. The final test-piece was allowed to cool naturally, and was then broken, and the depth of chill recorded with the number of the roll.

The Melting of Old Rolls.

It was found to be interesting to cast a pair of rolls early in the year, and after these had done good service and been worn out, later in the year to charge them whole into the furnace, melt them down with new iron, re-cast them and send them into service again. In making rolls specially mild, with total carbon under 2.8 per cent., there was found to be a difficulty in ascertaining the exact depth of chill, the top end of the fracture not being sufficiently grey to give a decided limit, also the metal sometimes responded to additions too easily.

To obtain more reliable control of carbon and silicon together, a joint melt from oil furnace and cupola was arranged—sufficient to produce three rolls. The composition of the metal after correction of the chill was taken to be normal, that is about 3.1 per cent. carbon, 0.80 per cent. silicon, and one roll was cast. The remaining metal was then poured back into the oil furnace, into which suitable quantities of mild steel, ferro-manganese and ferro-silicon had been charged, and the taphole made up, whilst the bulk of the metal was being corrected and the one roll cast.

When the solid metals were dissolved and the bath hot again, tests were taken out and it was found that by adopting the above procedure, the chill was within the measuring capacity of the standard test-piece. There are objections to the use of ferro-manganese and ferro-silicon, in that being so light, and floating on the surface of the liquid metal, there is some doubt as to how much is effectively used and how much oxidised, but under the above conditions, the alloys, being crushed into small pieces, and pre-heated, contact with the molten iron produced rapid absorption without excessive loss.

At all events, the method described was found to be most effective in producing very mild rolls with C 2.50 per cent. The chill was verified by duplicate tests from the furnace at short intervals, and the furnace tapped and the metal cast directly, only a final test for record purposes being made. The same principle of obtaining a bulk of metal of steady composition was also employed for producing normal rolls.

In all manufacturing operations, it is always necessary, on account of the time schedule of the shop, that variable material should fall within reasonable limits, so that adjustment can be made speedily, and the operations completed promptly.

To make allowance for possible variation in the old rolls charged, and stray material, the same useful method of averaging was employed, of joint melts with cupola metal, so that each kind of metal corrected the other to some extent. Sometimes, over a period it was possible, using the oil furnace alone, by adding or reducing a few points of silicon or manganese, to obtain a corresponding response in the chill, but generally it was better to employ mixed metals, from the additional consideration, that equivalent results are produced by diluting the more expensive oil furnace metal with the cheaper cupola metal. There are also additional advantages that, for calculations, it is not always easy to arrange that four elements in one mixture should be correct, so that the other mixture affords opportunities for adjustment.

A Specialised Procedure.

On occasion a programme of the following order was carried out:—A ladle of metal was prepared and corrected, so that the carbon and silicon were approximately known. After making one or more roll castings, the remainder of the metal, a known quantity, was returned to the oil furnace, in which was already charged mild steel and alloys. A further quantity, in the form of another calculated mixture melted in the cupola, was then added to

the oil furnace for the purpose of producing a definite quantity of liquid metal of composition within fairly narrow limits. It may not be clear why these somewhat devious methods should be necessary, but the reason is to be found in the variety of sizes of rolls to be cast.

Standardised Rolls.

Without wandering too far from the main theme, it may be pointed out that there is a wide field in which economies might be effected in standardisation of roll sizes. Not only do lengths and diameters of barrels vary far more than necessary, but also sizes of necks and shapes of tenons differ widely, not only in different works, but between mills in the same works. More especially in a difficult technical process like the manufacture of chilled rolls, would standardisation lead to economies, because rolls proved to be either short or excessive in chill for one mill, would be quite acceptable for another purpose, instead of being entirely rejected.

In other cases, minute surface blemishes which render a roll altogether unsuitable for service, are in no way detrimental in rolls for other classes of work. Assuming it were agreed to employ certain standard sizes of rolls and shapes of tenons, as far as the mills are concerned, the necessary alterations to chocks, bearings, coupling boxes and spindles, would be relatively a small matter, whilst from the roll founder's standpoint, the reduction in stocks of chill moulds and patterns would be a great saving, together with the higher percentage of acceptable rolls.

Each chill mould is only applicable to slight variations of size of roll. It may be possible to use a larger chill than the roll requires, and turn off the surplus metal. A long chill mould may have the neck and tenon moulded inside it, to utilise the mould for producing a shorter roll. For sizes only occasionally called for, it is undesirable to keep more than one mould, and hence necessary to cast on successive occasions from the one mould to produce a pair.

Thus, for one medium-sized roll to be made from cupola metal, the correct quantity of metal would cool too quickly in the ladle for a chill-test to be made. Hence, twice the quantity or more of suitable metal was melted down, and the heat of the larger bulk was retained long enough for the purpose. After correction and casting, the metal remaining was poured into the oil furnace already hot from the previous heat, and charged with alloys and mild steel to reduce the carbon. The next metal from the cupola had also to have a much higher silicon content, since the silicon percentage is also reduced. The resulting bath is the product of two lots of liquid metal, and the solid metals charged, which renders careful calculation of the mixtures necessary. Also, there are only cupolas losses to be allowed for, as oxidation is slow, under these conditions, in the oil furnace, and generally the final analysis responds very well to calculations.

To melt down calculated mixtures in cupola and oil furnace; to test the latter for chill depth with due attention to the test plate, and time and cooling of piece; to mix the metals in the ladle noting temperature meanwhile, and make further chill test; to correct with due regard to temperature; to pour back part of the metal on to alloys in the furnace, and complete with the addition of another calculated mixture from the cupola; to correct the bath after chill test and make further castings, and to make final chill test for record purposes—all this was felt to be real metallurgy, in the strictest sense of the word.

TESTS.

Tensile tests were made in some cases by turning a piece of the lower part of the vertical runner from the trumpet. This being circular, about 2¾ in. diameter, formed useful material for the purpose and pieces 0.564 diameter were turned and pulled, the tests, being all made on pieces taken and prepared under similar conditions, may be considered as comparative.

Transverse tests were occasionally made of a somewhat arbitrary character. Part of the vertical runner from the rolls was turned to 1¼ in. round approximately, and tested transversely on a 12-in. length. The pieces were gauged with micrometer, and the breaking load calculated as tons per sq. in. of section. Deflection was not measured. It will be seen that approximately the transverse tests follow the tensile tests, as is shown in Table VI.

Table VI.—*Co-relation of Tensile and Transverse Tests.*

No.	Actual Tensile.	Transverse.
136	11.75 tons.	12.40
137	8.54 ,,	9.93
138	12.42 ,,	13.52
139	12.32 ,,	13.19
146	8.86 ,,	12.42
141	10.67 ,,	10.15

Scleroscope tests were occasionally made on the roll barrels when turned, and are set out in Table VII.

Table VII.

No.	C. Per cent.	Scleroscope figure.	Remarks.
237	2.69	56—57	
240/1	2.52	58—62	New condition.
240/1	2.52	67—70	After use.
240/2	2.52	64—66	
The same after 30 working shifts		64—66	
217	3.18	69—71	
249	3.16	64—66	
292	2.80	60—63	
304	3.12	61—62	
312	3.19	61—62	After use.
278	3.33	67—67	
253	3.02	57—58	Before use.
311	2.94	55—57	Before use.
313	2.98	57—58	After use.
302	3.00	58—59	Before use.
290	2.99	57—57	After use.
290	2.99	59—60	Deeper cut in o mottle.
326	3.23	59—60	
316/2	3.12	64—64	
316/2	3.12	65—67	After 12 shifts use.
316/1	3.12	60—62	Newly turned.

The writer would acknowledge with the highest appreciation the co-operation of Mr. Percy J. Habershon in conducting the practical work together with close discussion of theoretical considerations.

The Manchester City Council, on April 4, approved a recommendation of the Electricity Committee to grant a contract to a Belgian firm for the supply of a 2,500 kilowatt motor converter for £5,650. Mr. Dagnall, chairman of the committee, said that when they asked a British firm to quote for the tender the reply was 40 per cent. higher than a previous quotation by them for exactly the same machine. The British quotation was nearly £8,000. Moving that the matter be referred back, Mr. Brine said Lancashire and Britain were suffering from unfair overseas competition brought about by low rates of pay. His amendment was defeated.

Table V.—*Tests on Chill Rolls.*

No.	C.	Si.	Mn.	S.	P.	Chill on test-piece.	Casting temperature.	Tensile.	Metal.
137	3.58	0.76	0.31	0.22	0.33	1⅜ in.	1,230	8.54	Cupola.
148	3.68	0.81	0.32	0.19	0.32	1½ in.	1,225	8.23	Cupola.
146	3.36	0.70	0.31	0.13	0.29	1 5/16 in.	1,220	10.53	Cupola, plus oil fee.
144	3.32	0.65	0.33	0.15	0.26	1 7/16 in.	1,235	11.07	,, ,,
136	3.30	0.69	0.29	0.15	0.23	1 7/16 in.	1,215	11.75	,, ,,
139	3.28	0.73	0.27	0.16	0.27	1⅜ in.	1,250	12.32	,, ,,
149	3.27	0.76	0.37	0.16	0.20	1 7/16 in.	1,215	10.33	,, ,,
138	3.18	0.85	0.29	0.16	0.31	1 5/16 in.	1,230	12.42	,, ,,
141	3.09	0.84	0.29	0.16	0.29	1 in.	1,245	10.67	,, ,,

Hand-to-Mouth!

By "Onlooker."

During the past few years, fraught as they have been with many disastrous slumps in the quotations of the principal non-ferrous metals, a very marked change has come over the buying methods of consumers, whose lack of faith in "futures" has been illustrated by their anxiety to purchase only cover for immediate requirements. True, there have been occasions when after a particularly severe break in the price, buying has developed on more generous lines, but it is notorious that markets always look weakest at the bottom, and very few gold medals have been awarded for correct diagnosis of non-ferrous metal situations!

As far as copper is concerned, another factor in the changed conditions of marketing has been the formation of an American selling organisation, which by eliminating the middleman has reduced the floating stocks of unsold copper in Europe. This has materially increased the difficulties of the course pursued by buyers, for in all hand-to-mouth purchasing the "fly in the ointment" is, that factory stocks of raw material are dropped to a minimum as a natural corollary to the scheme, and when stop-gap buying becomes necessary, as it always does sooner or later, it is difficult to lay hold of prompt metal.

From a buyer's point of view, there is, undoubtedly, much to recommend the cautious policy of covering only immediate needs, and with lead and tin the course has been amply justified without consumers suffering the embarrassment of finding themselves in a tight corner for supplies. Users of high-grade spelter indulging in this practice found, however, during the early part of last year that arrivals of this metal from Vancouver and Tasmania are apt to be very erratic, and that the very last method likely to prove profitable in the long run was putting off purchases to the eleventh hour.

"Last minute" buying may bring thrills and dangers comparable with a toreador's exploits in the bull ring, the "bull" in this rather highly-coloured comparison being, of course, the risk of disaster from a stoppage through lack of the necessary raw material. In practice it certainly has the effect of imparting to the market a quiet appearance, for although tonnage is regularly being purchased and Board of Trade returns of imports show no falling off when compared with previous periods, it seems on the surface as if there were very little going on.

Hand-to-mouth buying, fraught as it is is with many dangers to its devotees, can only be justified as an attempt to break a quotation artificially upheld, or because every market pointer shows a period of sagging prices to be more than likely. Let it be too long indulged, and the habit formed among consumers will only tend to strengthen suppliers' hands, for their customers will be always bare of cover and short of stock. Such a state of affairs paves the way for a "ramp" among producers who have only to practice curtailment over a short period to create something like a panic among users and a scramble for supplies on a rising market.

Long term contracting is, generally speaking, a feature of "big business," and a prolonged spell of hand-to-mouth purchasing inculcates a huckstering spirit into the situation. Manufacturers must remember, also, that they, more than anyone else, form market sentiment by which the smaller buyers of manufactured products are guided. A group of rolling mills, for instance, practising the hold-back policy of eleventh-hour purchasing, must realise that such action will be carefully noted by stampers, spinners, and other hardware manufacturers whose raw materials are the brass-sheets and rolled copper from the mills.

There are fashions in business life just as in private affairs, and one of the results of hand-to-mouth buying is to spread abroad a feeling of distrust and uneasiness which, while lacking intangibility, is yet sufficient to check the flow of trade and eventually to produce a state of affairs closely approximating to stagnation. And stagnation in business means financial disaster!

Scottish Moulding Sands.*

By F. Hudson.

(*Continued from page* 266.)

[To illustrate the value of experiments on the skin-producing properties of various sands, a small water-meter gear-wheel casting was passed round.] The facing sand used for the teeth consisted of Belfast sand strengthened with a little artificial bond, whilst the other parts were faced with green sand. Fig. 21 shows the method used to make this wheel. No blacking or plumbago was used whatsoever.

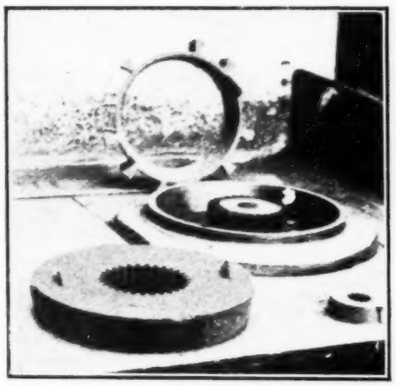

Fig. 21.—Shows the Methods of Making a Water-Meter Gear Wheel.

Blairgowrie sand also furnishes a very good example of the misleading results sometimes obtained when the ordinary "grip test" is used for testing moulding sands. In this case the sand is very strong when green, but very weak when dry. The "grip test," whilst being suitable for green sand, gives little information for sands used in dry sand work.

Fig. 20 is also interesting from another point of view. It has been said that the permeability of moulding sands is of no consequence. If this is a fact it would be interesting to know what caused the blown surface of the section in contact with the clay.

Preparation of Sand for Moulding.

For this work many different types of machines are used as well a shand-mixing, and correct treatment is needed to preserve good properties in a sand mixture. In green-sand work many foundries now use some kind of aerating machine, and tests have been carried out to illustrate the effect of these. An ordinary green-sand mixture was made up and tested after mixing by hand. The identical sand was then put through a Herbert machine, as illustrated in Fig. 22, and also tested. The product from this machine was then subjected to a light milling, and still further tests taken, and finally the original mixture was put through a Royer machine, as shown in Fig. 23.

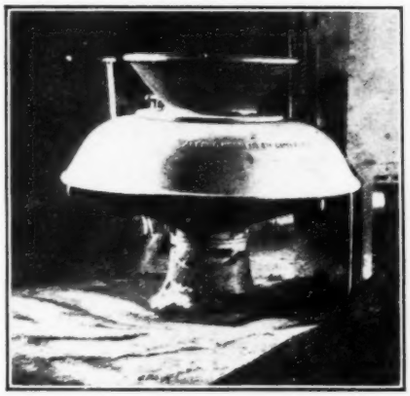

Fig. 22.—The Herbert Sand Mixer.

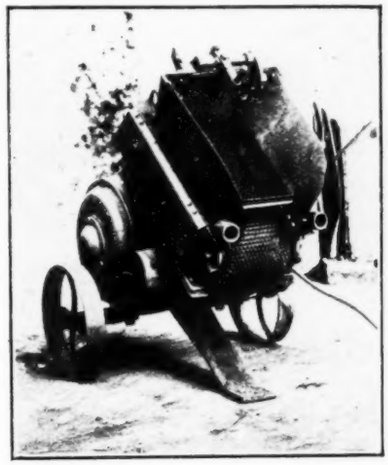

Fig. 23.—The Royer Sand Machine.

Table IV.—*The Effect of Various Machines used for Preparing Green Sand Mixtures.*

Method of Mixing.	Moisture content.	Green dropping test in inches.	Permeability in secs.
	Per cent.		
Hand mixed	8.0	2.4	93½
Mixed in Herbert machine	8.0	2.6	92
Mixed in Herbert machine and milled for 5 minutes in light pan mill ..	8.0	2.9	123
Mixed in Royer machine..	8.0	2.54	93½

Table IV gives the test results, from which it should be quite clearly understood that the sand was the same in all these tests, and naturally the moisture content is uniform. In making the test pieces the same degree of ramming was applied to each. From these results it is obvious that little difference exists in the sand put through the two aerating machines. Both have the same bond strength with low permeability. It would seem that by choosing suitable sands and mixing them in a machine designed to rub the sand grains and bond together without the heavy pressures prevalent to pug mills, a uniform sand would be strength and permeability. However, the sand from these machines is slightly stronger than the same sand hand-mixed, yet the permeability remains the same. In the case of light milling naturally the bond strength is considerably increased with the formation of a closer sand.

The value of these machines to the foundry exists in their adoption to production methods rather than to the production of special properties in the sand. A green-sand mould made from aerated sand will be no more open than a similar mould made from hand-mixed sand. The strength of the sand, however, will be slightly increased in the aerated material.

The preparation of dry sand and loam calls for greater care than is usually needed for green-sand work. As a general rule the pan-mill reigns supreme in this sphere of foundry work. Accordingly tests have been conducted to illustrate the effect of milling a dry-sand mixture as regards sand texture, strength in the green and dried condition, and permeability; the results being compared against the same sand hand-mixed and mixed in a machine free from the crushing action of pan-mills. Nearly all of the local bonded sands are obtained from rotten rocks, which have to be milled in order to obtain a suitable sand, and the effect of milling is thus of double importance, especially when clay is added to improve the bond. At the present time such bonded sands are inferior to naturally-bonded moulding sands where the silica-sand grains are coated with clay deposited from water. This inferiority is due to the fact that when milling or mixing sand in the pan-mill, excessive milling is required to get the clay bond uniformly distributed. During this milling operation the actual sand grains are crushed, and their uniform size destroyed. Thus it is obvious that great difficulties attend the production of ideal sands from pan mixing, and it is a very difficult matter to obtain a sand having a good bond

Fig. 24.—The Rotoil Machine.

Table V.—*The Effect of Various Methods used for Preparing Dry Sand Mixtures.*

Treatment.	Mechanical grading on dry sample.								Rational analysis.		Moisture. Per cent	Tested green.	Dried at 450 degs. F.		
	Pass 20	Pass 30	Pass 40	Pass 60	Pass 80	Pass 90	Pass 100	Pass 120	Per cent. clay	Per cent. Sand		Green dropping test in inches.	Tensile ozs. per sq. in.	Trans. ozs. per sq. in.	Perm. in secs.
Mixed by hand	91.04	89.60	83.75	71.70	43.84	35.96	33.20	25.79	31.4	68.6	9.6	2.00	201	40½	252
Milled in pan		M	illed	at 10	per ce	nt. m	oistur	e and	dried	down	to 9	per ce	nt. for	testing.	
Mill. 5 min.	91.97	91.00	80.40	72.54	45.00	38.40	35.20	27.55	33.8	66.2	8.0	2.35	219	57	241
10 min.	—	—	—	—	—	—	—	—	—	—	9.2	2.55	391	85½	1,371½
15 min.	92.82	91.38	85.79	73.21	45.99	39.77	38.82	30.22	—	—	9.2	2.73	407	105	1,684½
20 min.	89.95	88.80	83.29	70.94	45.59	39.27	37.79	31.12	38.9	61.1	9.1	2.80	572	105	2,037
Mixed in Rotoil		M	illed	at 12	per ce	nt. m	oistur	e and	dried	down	to 8	per ce	nt. for	testing.	
Machine 5 min.	88.91	87.71	81.70	68.86	40.92	33.74	31.68	25.04	32.4	67.6	8.5	2.25	220½	59	462½
10 min.	88.95	88.12	83.02	69.02	42.05	34.25	32.10	25.54	—	—	8.4	2.50	261	63	430½
15 min.	—	—	—	—	—	—	—	—	—	—	8.5	2.77	239	58½	283
20 min.	91.46	90.42	85.25	72.15	43.32	35.46	32.39	24.65	35.1	64.9	8.4	2.55	252½	80	138½

Note.—In each case the mill was loaded to full capacity taking 4 cwts. of sand.

* A Paper read before the Scottish Branch of the Institute of British Foundrymen, Mr. Longden presiding in the absence of Mr. Thomas Bell through illness. The author is metallurgist to Glenfield and Kennedy, Limited.

obtained that would give equal result to naturally-bonded moulding sands. To this end a mixing of dry sand was made in the Rotoil machine, which has been recently placed on the market. This machine is illustrated in Fig. 24.

In Table V are given the test results obtained for comparison between hand-mixing, pan-milling and sand mixed in the Rotoil machine. Taking the texture of the sands first, it will be noticed that 25.79 per cent. of the hand-mixed batch passes the 120-mesh sieve. The same sand after being milled for 5 minutes gives 27.55 per cent., which steadily increases up to 31.12 per cent. after 20 minutes' milling. This clearly shows that the sand is being crushed as milling proceeds. On the other hand, the same sand after being mixed in the Rotoil machine shows a decided reduction in the percentage passing the 120-mesh sieve, which points to the fact that the clay bond is being transferred to the sand grains and increasing them in size. In regard to strength of the sand, milling unquestionably increases it, but, at the same time, increases the permeability figure. In this experiment 20 minutes' milling increased the strength of the sand by approximately 160 per cent., and "closed up" the permeability by 700 per cent. This is not a good condition for moulding sand to be in. The sand mixed in the Rotoil machine was increased in strength by 100 per cent., whilst the permeability was made 45 per cent. better. This is a decided improvement over the properties exhibited by the sand before mixing.

At the present time far too many foundries rely upon the addition of ashes, sawdust, horse manure, etc., to make their sands open, and it will be a very good thing for the industry in general when a serious attempt is made to produce naturally-permeable sands. Once a sand is over-milled there is no mechanical treatment that will open it up again, and the only resource is to add artificial venting mediums. It is a very important point to control the milling of dry sand and loam work In this respect better castings would be produced by using high-class sands that require little milling than by attempting to produce sand mixtures overloaded with floor sand or black sand, which need excessive milling to bring them up to condition.

Fig. 25 gives the results of Fletcher's subsidence test on the effect of milling which confirms the previous remarks. In these tests the dry sand was made from two parts dry-sand floor sand, two parts Loudoun rock sand, and one part sea sand, whilst the green sand was the ordinary facing mixture as used in the foundry. It is very probable that all pan-mills will not crush the sand as found in the last experiment, and the best mills are those having cogged rollers with suitable means of controlling the pressure applied to the sand, and small mills are more efficient in redistribution of the bond than large ones. In most foundries, however, it will be found that sand mixed in the pan-mill for over 10 minutes will be crushed. The effect of an aerating machine, such as the Royer, on dry-sand mixtures is to put the sand into better condition for moulding. Due to the "fluffy" nature of the aerated sand a better impression of the pattern is obtained, and the sand can be rammed closer. If care is not taken, however, this closer ramming can result in making the mould impermeable. This is a case when one would have thought the opposite would have existed.

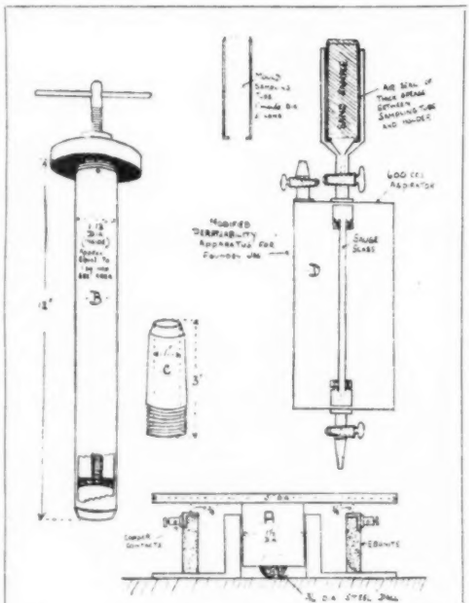

Fig. 26.—Foundry Sand Testing Apparatus

Reviewing the work done so far in these experiments the physical properties of the sands and the effect of different mixing machines upon those physical properties are known. If this be the case surely it is a practical proposition to make up moulding sand mixtures that will exhibit desired properties for producing good castings, providing that the moisture content of the sand and the degree of ramming are controlled. For this purpose special apparatus has been designed for foundry use to control such variables and also to enable an idea being obtained of the working limits concerning strength of bond, permeability, etc., required of moulds for the most successful production of castings.

Fig. 26 shows the foundry sand and mould testing apparatus, A being a mould hardness-tester, B green dropping-test sampling-tube, C the permeability sampling tube, and D a very convenient form of permeability apparatus for foundry use. The mould hardness-tester consists of a brass base-plate supporting a bearing in which slides a plunger. At the top of this plunger is a loading table, whilst at the bottom is imbedded a ¾-in. dia. steel ball. Surrounding the bearing is an ebonite ring having copper contact points at the top, this serving both as a distance stop for the ball penetration, and also for coupling up with a small electric lamp and battery as an indicator when maximum ball penetration has been obtained. The principle of the test is to apply weights to the table until the table rests upon the contact points, and so short-circuiting the current which causes the lamp to light. At full load the ball is imbedded in the mould up to half its diameter, namely, ⅜-in. The hardness index of the mould under test is expressed by the weight required to imbed the ball, plus 2 lbs., which is the weight of the table and plunger.

The green dropping-test sampling-tube consists of a brass tube having a knife-edge at one extremity and a cap at the other having a slow thread screwed hole in which works a long spindle attached to a piston. The cross-sectional area of this tube is exactly 1 sq. in. The method of using this tube consists of screwing back the piston to the closed end and pressing the open end into the mould, and extracting a sand-sample similarly to cutting runner and riser "gits" as practised by the moulder. Upon ejecting the sand in a horizontal plane by means of the piston and measuring the overhand after fracture of the sand has taken place, an index of the bond strength is obtained.

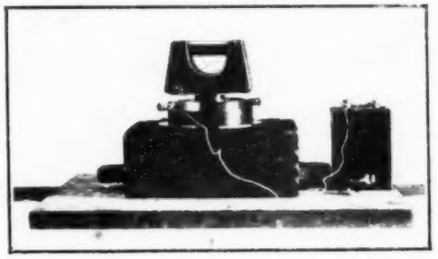

Fig. 27.—Mould Hardness Testing Apparatus.

In the case of the permeability sampling tube C, this is pushed into the mould in the same way as tube B, and a sample of sand obtained for placing in the permeability apparatus described previously. This permeability apparatus is not quite suitable for practical foundry use, and consequently it needs modifying, as shown at D, in Fig. 26. This apparatus consists of a cylindrical aspirator vessel connected to a metal test piece holder. The sand sample is taken by means of the sampling tube, as shown at the top of the sketch, and placed in the holder of the permeability apparatus. A complete operation for testing a green sand mould is as follows.

The permeability sampling-tube is greased inside and pressed into the mould. After extracting, the ends are levelled and the outside of the tube cleaned and coated with grease. The cock at the base of the aspirating vessel is now closed and the

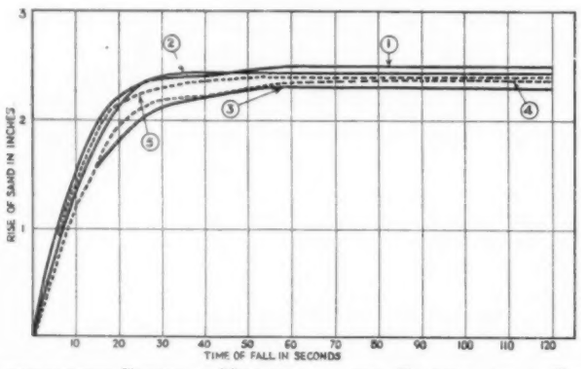

Fig. 25.—Graph, showing the Effect of Milling on the Texture of a Dry Sand Mixture (Fletcher's Subsidence Methods):—1, Hand mixed; 2, pan milled for 5 minutes; 3, pan milled for 20 minutes; 4, mixed in Rotoil machine for 5 minutes; 5, mixed in Rotoil machine for 20 minutes.

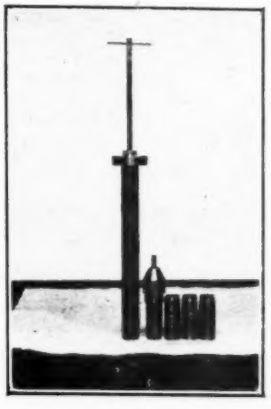

Fig. 28.—Green Dropping Test and Permeability Mould Sampling Tubes.

two top ones opened. Water is poured into the holder until the vessel is full, as shown by the water gauge. Both these cocks are now closed and the bottom cock opened. The sampling-tube is now placed inside the holder, and the grease coating acts as an air seal. The cock at the base of the holder is now opened and water drops, sucking air through the sand sample. The time taken for the water to drop from the top of the water gauge glass to the bottom is an index of the permeability of the sand. For dry sand samples the mould is sampled in a similar way before drying. After the test piece is dried it is extracted from the tube by hand and the tube greased inside and out, the test piece replaced and put into position on the apparatus.

Fig. 29.—The Treuheit Mould Hardness Testing Apparatus.

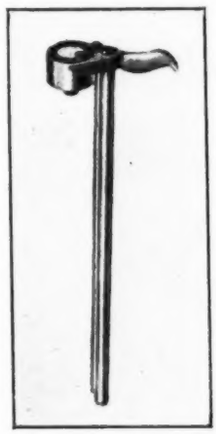

Fig. 30.—The McIlvaine Moisture Meter.

Fig. 27 illustrates the hardness tester in position upon a small plain top part, and Fig. 28 shows the green dropping-test and permeability-mould sampling-tubes.

In Fig. 29 is shown, as a matter of interest, the only other mould hardness tester known to the author. This is the Treuheit instrument, of German origin. The principle consists of a 4/5-in. dia. ball loaded with a constant weight of about 18 ozs., which is applied to the mould surface, and the depth of indent read off on the micrometer scale at the top. This figure is then converted to the Brinell hardness scale. The instrument has several objections, but space is too limited to describe them.

Fig. 30 illustrates the McIlvaine moisture meter, which is an excellent means for controlling the moisture content of foundry sands. It reads off the moisture content of any sand heap direct after standardising against a chemically conducted determination.

By the use of these instruments just described it is possible to control foundry sand and moulding conditions to a very near limit. At the same time they can give a very great deal of information relative to the properties imparted to the mould by different ramming methods.

Table VI gives the results of tests conducted on actual moulds made in green sand and rammed by five different methods. In no instance was a mould obtained with uniform hardness. In hand ramming the hardness varied from 14 to 36, but those moulds made by skilled time-rate men were reasonably uniform, as shown by the side cheek for headstock and the plain 10-in. top part immediately below. It was found that in jolt-rammed castings the sand at the parting was much harder than at the pattern face, whilst in the other methods of machine moulding tested the pattern face was invariably harder than at the parting. For consistent uniformity in mould hardness, strength of bond and permeability the tests favour jolt-rammed moulds. All the moulds tested produced good castings, and it is quite obvious that actual mould hardness is of little moment in determining whether or not the mould is in the best condition for successful casting production. Strength of bond, as shown by the green dropping test, and permeability, are much more important features, and providing a bond strength of 2½-in. is obtained, together with a permeability as low as possible but not exceeding 80 secs., then for green sand work no fear need be anticipated about defective castings. This result confirms the specification put forward by Smalley for general grey iron castings made in green sand.

In conclusion, the author wished to thank the directors of Messrs. Glenfield and Kennedy for their permission to publish these results, and Messrs. Wyllie, McFedris and Tyrie for their valuable assistance.

Table VI.—*The Effect of Moulding Methods upon Green Sand as Shown by Foundry Sand Testing Apparatus.*

Method of moulding.	Type of casting moulded.	Mould hardness, in lbs.	Green dropping test in ins.	Perm. in seconds.
Hand rammed ..	Plain top part	14 to 20	—	—
	Side cheek for headstock (ramming on soft side) ..	16 to 17	—	—
	Plain top part 10 in. deep	19 to 22	—	—
	Plain top part, 10 in. deep	19 to 29	1.66	—
	Plain top part, 6½ in. deep	Edge 22 / Centre 36	1.88	73 / 80
Jolt rammed (Mumford) 8 in.	8 in. lt. valve body (70 jolts). Parting	27 to 31	1.78	55
	8 in. lt. valve body. Parting	32		65
	8 in. lt. valve body. Pattern face	21	—	—
	6 in. reflux valve body. Parting	22	—	—
	6 in. reflux valve body. Parting	21 to 26	—	—
Hydraulic squeezer ..	Surface box. (1 squeeze)	18 to 20	1.34	45 / 52
Jolt squeeze (Mumford).	4 in. valve wedge (11 jolts). Parting	22	1.75	115
	4 in. valve wedge. Parting	22		83
	4 in. valve wedge. Pattern face	40	—	—
Sand slinger (Beardsley and Piper).	4 in. valve body. Parting	27	2.12	75
	4 in. valve body. Pattern face	40		64
	4 in. valve body. Parting	9 to 13	2.12	47 / 50
	4 in. valve body. Parting	27	—	—

New Companies.

Workman, Clark & Company, Limited.—Capital £400,000. Shipbuilders. Directors: William Strachan, William Lovett, James Wilkie, John William Hamilton, Major Patrick Campbell Anderson.

William Freer, Limited.—£25,000 in £1 shares. To acquire the business of a heating and domestic engineer, plumber and sanitary engineer as formerly carried on by W. Freer as William Freer at 36, 38, and 40, Wellington Street, Leicester; 8, Southampton Street, Bloomsbury, W.C.; and 50, St. George's Plain, Norwich.

T. J. Thomson & Son, Limited.—Capital £3,000 in £1 shares. To acquire the business of an iron and steel merchant formerly carried on by the late W. T. Thomson, at 17, Albert Road, Middlesbrough, as T. J. Thomson & Son. Directors: H. E. I. Turner, 17, Albert Road, Middlesbrough, steel merchant (managing director); Mrs. M. L. Turner, 17, Albert Road, Middlesbrough; J. Pashley, High Street, Sheffield, iron and steel merchant; J. M. Trickett, High Street, Sheffield, iron and steel merchant.

Unislip Propeller Company, Limited.—Registered April 7. Capital £5,000 in £1 shares. To acquire interests in inventions relating to marine and aerial propellers and propelling machinery of all kinds and, in particular, the Unislip propeller, and to carry on the business of designers and manufacturers of propellers and propelling machinery of all kinds, etc. Directors: A. Kari, Milburn House, Newcastle; W. J. Wadling, Milburn House, Newcastle; J. Shaw, 18, Shortridge Terrace, Newcastle; J. M. Pybus, Milburn House, Newcastle. Registered office: Milburn House, Dean Street, Newcastle.

D. F. Wishart & Company, Limited, 18, Picardy Place, Edinburgh.—Capital £45,000 in £1 shares. Private company to acquire the business of D. F. Wishart & Company, iron merchants, 18, Picardy Place, Edinburgh.

Company Reports.

Babcock & Wilcox, Limited.—Dividend, 8 per cent., free of tax, making 15 per cent. for year.

United Flexible Metallic Tubing Company, Limited.—Final dividend 3½ per cent., making 6 per cent. (unchanged).

Smith & McLean, Limited.—Net profit £22.247; to ordinary reserve fund, £7,000; dividend of 6 per cent. on the ordinary shares; balance carried forward, £19,614.

J. Stone & Company, Limited.—Net profit, £234,555; brought in, £72,892; available, £307,477; ordinary divdend, 15 per cent.; reserve, £50,000; forward, £128,387.

Projectile & Engineering Company, Limited.—Profit, £15,415; brought forward, £34,613; final dividend, 5 per cent., making 7½ per cent. (unchanged); forward, £29,777.

Central Provinces Manganese Ore Company, Limited.—Net profit, £280,870; brought in, £66,034; final dividend, 15 per cent. and bonus 5 per cent., making 30 per cent. for year; reserve, £100,000; carried forward, £21,904.

British Electric Transformer Company, Limited.—Net profit, £53,702; brought forward, £9.402; available, £63,105; reserve account, £10.000; depreciation reserve, £5.000; preference dividend, 7 per cent. for year ended December 31, 1927, £21,000; dividend, 5 per cent. on ordinary shares, £16,250; carry forward, £10,855.

Obituary.

The death occurred, on the 8th inst., of Mr. William Willox, formerly chief engineer of the Metropolitan Railway. Mr. Willox served his pupilage with Bell & Miller, of Glasgow, and was later engaged on the construction of railways both at home and abroad. He joined the Metropolitan Railway as chief engineer in 1906.

Restrict "Rush Orders" in the Foundry.

By W. J. Hiscox.

A disadvantage under which the foundry attached to an engineering works labours, as compared with the independent foundry, is that it can be blamed for the shortcomings of other departments. It is no uncommon thing in a large engineering works for a foreman of (say) the machining department, to cover himself by the statement that "the casting was not delivered to time," whereas an investigation would show that the delay was due quite as much to him as to the foundry.

But the only fact which becomes patent is that the job was delayed because the casting was late; no mention is made of the fact that the casting was ordered late, or that the instructions were not complete and had to be amplified, or that the casting was a replacement of one which had been scrapped in the machining department. The real reasons for delay would be forthcoming were the foundry foreman asked for an explanation, but often he knows nothing about the matter until some time later, when he receives a general reprimand for being late on deliveries.

In the engineering factory it is usually accepted that if the casting is delayed all other departments must be late on delivery; but while this does not necessarily follow in all cases, it is undoubtedly a very good thing for production as a whole to keep the foundry up to the mark. This means that the requisite facilities must be provided to cope with the demand, and care taken to see that the planned arrangements of the foundry foreman are not unduly interfered with.

It is in this respect, however, that the foundry is often handicapped, for although the "rush requirement" cannot be entirely eliminated, in many works it is too much in evidence. It is obvious that if the foundry is working to capacity on a pre-determined programme, and unforeseen "rush orders" make their appearance, these are bound to dislocate the programme and cause delay in at least one direction. It may be that in some circumstances the delay is not of vital import, as it can be made good in later stages of manufacture, but the foundry foreman cannot always accurately determine what can be displaced with the least embarrassment to production, because other departments are involved.

Why the Necessity for Rush Orders.

He knows this, so far as his own department is concerned, but he cannot always foresee the ultimate result, and the obvious thing to do is to restrict "rush orders" as much as possible. No "rush order" should be placed in the foundry until it is definitely ascertained that it is quite unavoidable, while the circumstances which brought about the necessity should be thoroughly investigated. It is not enough to know that the "rush order" is necessary; it must be known why it is necessary.

The millwrights' and tool departments are often involved in this matter, and in many cases the requirements of these departments cannot be predetermined. The breakage of a plant connected with the plant equipment cannot be foreseen, and an immediate replacement is necessary, otherwise machines are at a standstill and production is delayed. This means that a new casting must be put in hand at once, even though it means delaying other work to do so. But in some cases it is possible for the millwrights (or the tool room) to hold a small stock of such parts, or at least hold one spare in stock, so that the replacement can be effected without having to place a "rush order" on the foundry for another casting.

For not only is the foundry affected by this, but the job is also. With the best will in the world, it is impossible to get the new part cast and machined under a day (and, maybe, two are necessary), and during this time the affected plant is idle. It is not suggested that in every case it is practicable to hold stocks (or even spares), for the trouble may come from a quite unexpected quarter; but in scores of cases which have come to the knowledge of the writer precautions could have been taken which would have materially speeded up the job, and avoided the issue of a "rush order" on the foundry.

Cost of Rush Orders.

The "rush order" is always expensive, not only as regards the work covered, but more particularly as regards the displacement. In nearly every instance the production value of the parts displaced is much higher than that of the part covered by the "rush order," and the result is that the foundry earns 10s. on the "rush order" and loses £2 on the displacement.

Sometimes, too, the "rush order" is connected with production, the reason usually being that instructions are delayed. This is sometimes the fault of the drawing office, but more often the fault of the customer, who ought to be penalised by an extended delivery. In this matter the sales department can take action, pointing out to the customer that unless complete instructions are forthcoming immediately the promised delivery cannot be kept, but usually the representations of this department are somewhat weak, as there must be no risk of the order being cancelled.

The sales department is, as a rule, quite unacquainted with works procedure, and fails to understand what is involved when part of the instructions are delayed. The idea is, that, if the product covered by the order can be pushed along as far as possible, speedy completion follows the arrival of the final instructions, but no consideration is given to the methods by which that "speedy completion" is to be effected, or to what is involved. It is appreciated that a "rush order" must be issued, but this is regarded as a matter of necessity. If the effects were known, it is probable that steps would be taken to obviate this "necessity," which is uneconomical both from the standpoint of finance and of production.

Orders for castings to replace those scrapped during machining operations are frequent in some works, and naturally, such replacements are wanted in a hurry, especially when several machining operations have been completed before the scrapping occurs. Sometimes the casting itself is defective, and then, of course, the fault for delay lies with the foundry, but in most cases the scrapping is caused by machining errors. But whatever the cause, the effect is the same; a "rush order" is placed on the foundry which must receive priority, and if the job cannot be handled immediately any delay in the completion of the product is charged against the foundry.

Taking Care of Scrap Bogey.

Now scrap cannot be entirely eliminated, and while there is scrap there must be replacement orders. But here again it is possible to restrict the necessity for the latter; first, by an investigation into the reasons for scrap, which will do much to minimise it in future; and, second, by casting in excess of the actual requirement, so that spares are available. This, of course, cannot be done in the case of big castings, because of the expense, but it can be done in the case of smaller castings, and particularly where there is a likelihood of scrap developing. This can be ascertained from the records, for if these show that in the past there has been scrap associated with the machining of a specific part, future orders should cover a quantity in excess of the actual requirement, so that, should scrap develop, the parts can be replaced immediately without the necessity for issuing a "rush order" on the foundry.

It would be well if all "rush orders" were submitted to the works manager for his confirmation, so that he could investigate the circumstances in each instance, and this in itself would bring about a reduction. In most works, at the present time, the order emanates from the progress department, where the only facts for a consideration are that time is short, and the parts involved must be rushed through all manufacturing operations with all speed. The progress department will not tell the foundry foreman that he can displace a given job so that the "rush order" can be fitted in; it is expected that the programme of deliveries will still be adhered to, and if there is any delay the foreman is called to account, usually at a time when the circumstances which occasioned the delay are forgotten.

Every effort should be made by the management to restrict the number of "rush orders." Wherever possible, the millwrights' and tool departments should hold stocks of spares, which should be augmented as further investigations are made. The cost of these is trivial in comparison with what they will save, even though some remain untouched for years. So far as production "rush orders" are concerned, if the fault lies with the drawing office that department should be time scheduled and an explanation demanded for delays, while if the customer is holding up instructions he should be courteously informed that further delay will adversely affect the completion and delivery of the product.

The foundry is a "feeder" department, but it can only feed when it knows what to do. As, to be economical, the foundry must work to capacity, it is obvious that it must work to a pre-determined programme, which gives expression to the requirements of the other departments. If these departments cannot get what they want production is retarded, and there is an outcry, and this is bound to happen if, from any cause, the planned arrangements of the foundry are dislocated. The unforeseen requirements must, therefore, be reduced to a minimum, so that the known requirement can be satisfied.

Rumoured Reduction in Railway Rates.

Many rumours have been in circulation during the last week or so to the effect that a substantial reduction in railway rates might be expected almost immediately. While there is a measure of truth in these reports, the amount of the reduction is being grossly exaggerated.

The situation is interesting. Very considerable pressure has for some time been brought to bear upon the Government to make some concession to relieve the wretched state of industry in general and the coal, iron and steel industries in particular. The railways have always adopted the attitude that they could not grant further concessions without causing a direct and heavy loss to themselves, and consequently if the Government wished to lessen the burdens on industry through railway rates it would be necessary to first reduce the taxation to which railways are subject, and this is really the means being adopted by the Government.

We learn that the rating reform schemes envisaged by the Chancellor of the Exchequer, as part of his Budget proposals, include one that would have the effect of subsidising the railway companies. The plan contemplates a reduction in the taxation payable by the railways, in return for which concession certain railway rates, such as those on coal, iron, steel, etc., would be reduced.

The railways have always answered the complaints of the coalowners and merchants and the iron and steel manufacturers against high freights by pointing to the railways' bill of rates and taxes, which in 1926 amounted to £7,500,000. Supporters of the scheme now before the Government claim that it would be a simple method of readjusting both the railway companies' burden and that of the iron, steel, and coal industries.

We understand that while the percentage reductions mentioned in the rumours in circulation are absurdly high, the relief contemplated will be sufficiently large to have an important bearing on the future prosperity of the coal, iron and steel industries.

South African Iron and Steel Bill.—With reference to the short note in our issue for March 30, the joint Session of both Houses of the Legislature of the South African Union called to decide upon the Iron and Steel Bill owing to the Senate's rejection of the measure, has passed the Bill which provides for the promotion of an iron and steel industry in South Africa under State control.

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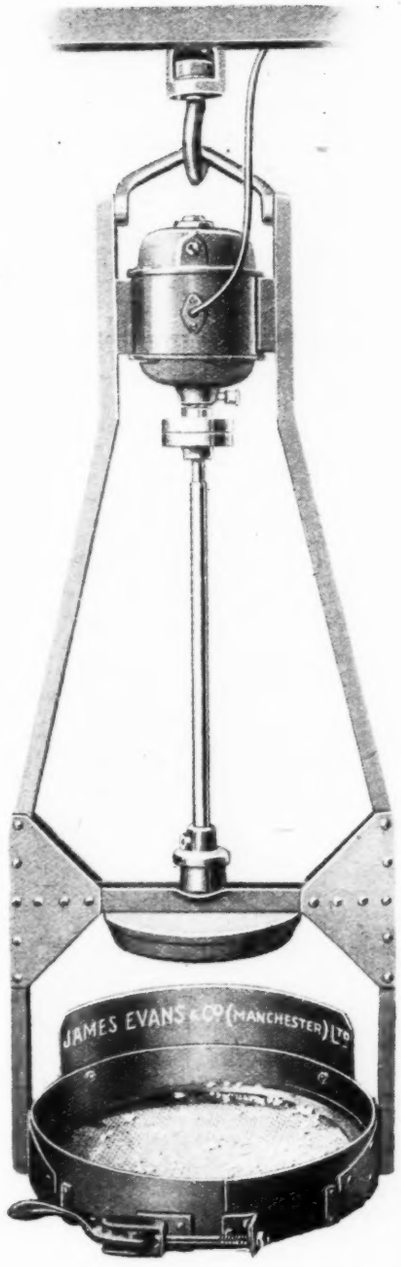

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The Manufacture of Pig-Iron in Natal.

THE NEWCASTLE PLANT.

Before a recent meeting of the Chemical, Metallurgical and Mining Society of South Africa, Mr. J. E. Holgate, in the course of an interesting Paper on "The Manufacture of Pig-iron in Natal, pointed out with regard to raw materials, that the iron ores of Northern Natal occurred in the Middle Ecca Beds or Coal Measures of the Karoo system corresponding to the lower Permian rocks of Europe in which the Coal Measures were found. The source of the iron-ore supply for Newcastle was Prestwick, lying about 10 miles N.E. of Dundee and 58 miles by rail from Newcastle. This had been proved to be an extensive bed lying very slightly off the horizontal with occasional slight undulations through a long range of hills. The outcrop round this deposit might be traced for many miles, and in 1925 it was decided to open the farm Prestwick, where the outcrop ore appeared to show the greatest expanse while boreholes had demonstrated continuity of the ore bed under the hill. This outcrop ore was easily uncovered and served as the original supply of ore for the blast furnace (about 30,000 tons). It consisted of a hydrated oxide of iron of the following average analysis:—Fe, 49.25; SiO_2, 8.0; Al_2O_3, 4.2; CaO, 0.50; MgO, 0.45; Mn, 0.43; P, 0.15; S, 0.04; loss on ignition, 15 per cent.

The Union Steel Corporation constructed their railway line six miles in length to connect with Tayside Station on the Vryheid-Glencoe line, at a cost of over £25,000, and established a properly equipped mining camp as there was every indication that this area would yield a permanent supply of ore. In the meantime an adit was driven into the hill which contained the main body of ore and arrangements made for intensive developments. Within 30 ft. of the surface the ore changed in a very curious way to a ferrous carbonate black in colour and very dense. The seam varied in thickness from 3 ft. to about 10 ft., and was at present being developed in a zone containing the thicker core, which would appear to run right through the mountain. Above the carbonate ore there lay a band of shale about 8 to 10 in. thick, covered by another thin band of anthracite coal 6 in. deep. The roof was a very sound sandstone, and timbering and pumping were on a very moderate scale, while the general mining conditions were good.

The ore had been found to be very uniform in analysis in all directions, the following being an average analysis for October, 1927:—Iron, 41.20 per cent.; SiO_2, 6.30; Al_2O_3, 2.70; CaO, 0.50; MgO, 0.20; Mn, 0.56; P, 0.14; S, 0.14; loss on ignition, 30.90 per cent.

The main adit was now nearly 2,000 ft. into the hill, and other adits were being developed with mechanical haulages to enable large tonnages to be handled. Coal-mining principles had been introduced utilising the pillar-and-stall system. At a later stage the economics of the longwall system might be tested in the thinner stretches of ore.

The bulk of the probable ore-bearing ground in the Prestwick area, continued the author, is held by the Union Steel Corporation whose leaseholds total about 12,000 acres, with a probable ore-bearing area of about 7,000 acres. The content of this ore-bearing ground would be about 60,000,000 tons, but as the possibilities of unknown adverse conditions or geological disturbances are considerable when dealing with ground not adequately prospected, a safe figure of 25 per cent. or 15,000,000 tons should be taken as a guide to the tonnage likely to be available.

Blast-Furnace Coke.

Up to the present time the Union Steel Corporation have not been in a position to manufacture their own coke, but have depended on the enterprise of certain collieries in Natal to meet their requirements. The two areas that serve Newcastle are the Dundee and Vryheid districts, both of which possess large reserves of suitable coal. In the former there is the Dundee Coal Company, who manufacture a by-product coke in a modern battery of ovens at Waschbank, about 50 miles from Newcastle.

The average analysis of Waschbank by-product coke may be taken as follows:—Carbon, 86.54 per cent.; ash, 11.05; sulphur, 1.01; phosphorus, 0.095; moisture, 1.30 per cent. The ash analysis is:—Silica, 46.20 per cent.; alumina, 39.50; lime, 2.10; magnesia, 0.95; ferric oxide, 8.30 per cent. This coke, made from coal containing about 18 per cent. volatiles is very strong and rather dense. The yield from the by-product ovens is probably in the neighbourhood of 70 per cent. On the whole it has worked satisfactorily as a blast-furnace fuel, but its combustibility at times is not as high as we should desire for our practice, although for foundry cupola work the extra strength is a valuable asset in withstanding the abrasion of pig-iron.

The Vryheid district produces coke at several plants situated at different points. Supplies are drawn from the following:—Tendega; New Tendega; Vryheid Coronation; and Bernica. The average distance from Newcastle is probably about 74 miles. This coke is made in beehive ovens, which are non-recovery. The average analysis of Vryheid beehive coke is as follows:—Carbon, 86.59 per cent.; ash, 11.95; sulphur, 0.75; phosphorus, 0.0055; moisture, 0.68 per cent. The ash analysis is:—Silica, 49.00 per cent.; alumina, 35.75; lime, 1.10; magnesia, 1.09; ferric oxide, 9.45 per cent.

The coals in the Vryheid district are eminently suitable for coke-making, and contain a somewhat higher percentage of volatiles than Dundee. The beehive coke is of excellent quality, although a little higher in ash. The porosity is high, and it possesses adequate mechanical strength. Owing to the wasteful method of production, the yield from the coal varies from 50 to 60 per cent., and the cost of production is naturally high, as there is no credit for by-products. The sulphur content is from 25 per cent. lower than in Dundee coke, and this is of considerable importance in furnace work.

The blast furnace was started up and ran for about six months on limestone obtained from Taungs in Bechuanaland, the distance from Newcastle being close on 400 miles. The stone was of excellent quality, but expensive through the high railage. Subsequently experiments were made with a dolomite obtained from Natal Spruit, near Johannesburg, about 200 miles distant, where a large deposit was exposed. Operating results were quite successful, and a large contract was entered into with a saving of about 10s. per ton of flux. The presence of 2.6 per cent. oxide of manganese in the dolomite is an interesting and valuable feature, as it practically cuts out the necessity for adding extra manganese to the furnace burden.

Blast-Furnace Plant at Newcastle.

The blast-furnace at Newcastle has the following dimensions:—Height, 70 ft.; hearth diameter, 10 ft.; bosh, 14 ft. 5 in.; bosh angle, 78 deg.; angle of inwall, 87 deg.; throat diameter, 10 ft.; bell, 6 ft.; number of tuyeres (diameter), 8 ft. (5½ in.). Blast is supplied by two vertical reciprocating engines which were converted from compressors originally used on the Rand mines by substituting on each engine two large-size air cylinders 60 in. dia. by 60 in. stroke. These engines are compounded and equipped with efficient condensing plant. Each engine is capable of delivering about 22,000 cub. ft. of free air per min. up to 12 lbs. pressure at 60 r.p.m., and one engine is always kept as a standby. These units have done good work, and there is always an ample reserve of blast for the maximum production. At the same time the running and maintenance costs are excessive, and the policy will be to install a modern turbo-blower at an early date. The boiler plant, which principally serves the blowing engines, consists of five Babcock & Wilcox units, each of about 325 h.p. with gas-firing, steam being generated at 160 lbs. per sq. in.

Four Cowper hot-blast stoves, 70 ft. high by 20 ft. dia., having firebrick chequers 7½ in. sq. have a total heating surface of about 42,000 sq. ft. per stove. A constant cycle is maintained on the four stoves, and by careful manipulation the air can be heated up to a maximum of 1,500 or 1,600 deg. Fah. with a fluctuation of not more than 100 deg. It is usual, however, to work on an average of about 1,200 to 1,300 deg.

The molten iron after tapping is cast in a pig bed having an area of about 120 ft. by 50 ft. This will comfortably accommodate sufficient moulding for 80 tons of iron. It is entirely covered and is traversed by a 10-ton Morris crane. The combs, weighing about 2¼ tons each, are taken away by the crane and placed on the table of a Lamberton pig-breaking machine and discharge automatically into trucks for dispatch. The molten slag is removed from the furnace in Dewhurst self-tipping ladles of 10 tons capacity. It is then dumped on a bank some distance away, and it is expected that a large portion of this slag will be used eventually as railway ballast.

There is a considerable surplus of gas from the furnace in normal operation which represents available power. This, of course, will be absorbed by further subsidiary industries which may be established. At the present time, spare electrical power is utilised in an adjacent brickworks and small foundry, and at an early date it is expected that the town of Newcastle will take all the lighting and power current required from the blast-furnace plant.

After the Newcastle plant was taken over by the Union Steel Corporation in an incompleted state, the services of an eminent consulting engineer, Mr. A. K. Reese, were employed to advise on design and to supervise the final construction of all details. Mr. Reese is a recognised authority in England and America on blast-furnace practice, and he is certainly entitled to great credit for putting the whole plant on a sound operating basis. In 1925 it was necessary first of all to alter the lining of the furnace and by increasing the hearth diameter ensure the furnace having the necessary capacity for exceeding an output rate of 50,000 tons per annum. With a hearth diameter of 10 ft. and other dimensions in correct ratio, combined with an auxiliary equipment adequate to deal with the necessary tonnage of raw materials, and ample hot-blast capacity, it was a matter of simple mathematical calculation from various formulæ to prove the furnace capacity. The author mentions this incidentally as the Government have recently disputed our statements and have withheld the bounty pending some further proof which they state has not been forthcoming. It seems hardly likely that any big industrial concern would spend a sum of over £300,000 on a plant under the auspices of the Bounty Act without being thoroughly satisfied that no possible doubt could exist as to the productive capacity.

The furnace was blown in during June, 1926, and the campaign lasted about 15 months, during which period 56,209 tons of iron were made, a policy of restricted output having been enforced. The whole of this iron was suitable for either steel-furnace or foundry use. The furnace was "closed down" at the end of September, 1927, owing to the excess of stocks of iron, but will resume operations in a few months' time. It is then anticipated that the full capacity of the furnace will be required to meet the increasing demands for pig-iron at Vereeniging and the various foundries of the railways and engineering works.

Operating Results.

In the first few months it was necessary to use practically all the oxidised outcrop ore from Prestwick, while the mine proper was being developed. This ore contained from 48 to 49 per cent iron, but was frequently rather friable through long weathering, and caused a lot of fines. This ore was very easily reduced and worked well, but at times the flue-dust loss in the gases was rather high. This phase, however, was purely temporary, and with the rapid development of the mine, the pure carbonate ore was reached, and

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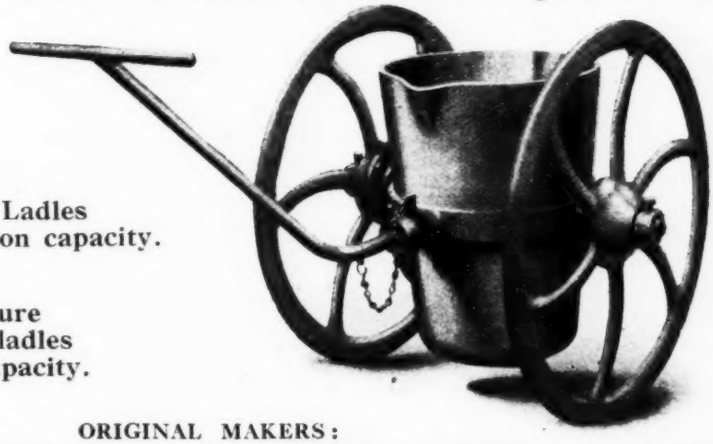

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this was mixed in gradually increasing proportions with the oxide ore at the furnace.

For a short period before closing down the furnace it was possible to have a run on 100 per cent. raw carbonate, and the results were very pleasing, particularly in respect of coke consumption. With all oxide ore our average coke consumption had been in the neighbourhood of 2,100 lbs. per ton of pig. This was steadily reduced until for a period on basic iron with all raw carbonate we obtained a coke consumption of 1,734 lbs. The furnace gas working on 100 per cent. raw carbonate was: CO_2, 15.0 per cent.; CO, 27.8 per cent.; ratio of CO to CO_2, 1.85.

Using a mixture of roughly 50/50 Dundee and Vryheid cokes, the slag analyses, shown in Table I, represent the best conditions of working for the corresponding grades of iron indicated. For high-silicon irons it is usually advisable to use Taungs limestone in order to keep down the manganese

Table I.—*Pig-Iron and Slag Analyses of the Newcastle Blast Furnace.*

	Analysis of pig.				Analysis of slag.				Ratio $\frac{CaO + MgO}{SiO_2}$
	Si. Per cent.	S. Per cent.	P. Per cent.	Mn. Per cent.	SiO_2 Per cent.	CaO Per cent.	MgO. Per cent.	Al_2O_3 Per cent.	
Basic	1.00	0.05	0.30	1.50	31.0	28.0	18.5	19.0	1.5
No. 1 Foundry ..	2.75	0.02	0.30	1.25	32.0	33.5	11.5	20.0	1.4

to 1.25 per cent. About 80 per cent. of the output, however, is of basic quality for the steel-works.

Furnace Records for August, 1927.

During August the output amounted to 4,152 tons, of which 74 per cent. was basic and 26 per cent. foundry.

Pig-iron Analysis.—Si., 1.42 per cent.; S., 0.051; P., 0.31; Mn., 1.42 per cent.

Slag Analysis.—SiO_2, 31.23 per cent.; CaO, 28.47; MgO, 18.36; Al_2O_3, 19.45; S., 1.75; MnO, 0.73; FeO, 0.55 per cent.

Raw Materials per Ton of Pig.—Carbonate ore 2,697 lbs., oxide 1,921 lbs.; total ores, 4,628 lbs.; coke, 1,941 lbs.; dolomite, 1,617 lbs.; slag per ton of pig, 1,500 lbs.

Analysis of Ore Mixture (as received).—Fe, 43.7 per cent.; SiO_2, 8.0; CaO, 0.30; MgO, 0.20; Al_2O_3, 3.8.

Analysis of Coke Mixture.—C., 86.03 per cent.; ash, 12.13; S., 0.89; H_2O, 0.95.

Analysis of Dolomite.—SiO_2, 2.2 per cent.; $Al_2O_3 + Fe_2O_3$, 3.5; CaO, 28.6; MgO, 18.7.

Other operating conditions were as follow: Average blast pressure, 9 lbs. at engines; average blast temperature, 1,160 deg. Fah.; average gas temperature, 310 deg. Fah.; average engine revolutions, 51 per min.; average volume of air per minute blown, 19,900 cub. ft.; average moisture content of air, 3 grs. per cub. ft.; weight of ore per round (6 barrows), 11,344 lbs.; weight of coke per round (6 barrows), 4,758 lbs.; weight of dolomite per round (3 barrows), 3,963 lbs.

Cost of Production of Pig-Iron.

During three months ended September 30, 1927, the output amounted to 11,825 tons. The consumption of iron ore was 26,974 tons, costing 10s. 5d. per ton, plus 155 tons of manganese ore at 31s. 4d. per ton and 84 tons of phosphate rock at 24s. per ton. The ore cost (4,603 lbs. per ton) per ton of pig was 24s. 4d. The cost of coke (1,995 lbs. per ton) was 27s. 8d. per ton; of dolomite, 9s. 1d.; and of limestone, 2s. 4d., making a total for raw materials of £3 3s. 5d. per ton. The cost of coal for the boilers was 8d. per ton; wages and salaries, 11s.; other costs, 5s. 4d.; making a total cost of £4 0s. 3d. per ton of pig-iron.

Operating and general charges during the three months amounted in all to 16s. 10d. per ton, over and above the raw-materials cost. Owing to restricted output the tonnage only averaged 129 tons per day over three months. For a maximum output of 165 tons these charges would be practically the same in total. The cost per ton of pig, however, would be less in the proportion of $\frac{129}{165} \times$ 16s. 10d. = 12s. 9d. Thus the maximum output would have shown a reduction in cost of pig-iron over the three months of 4s., giving £3 16s. 4d. as the lowest cost.

The Man and the Job.

The Problem of Getting them Together.

There is a good deal to be said in favour of a policy which aims at keeping in touch with every suitable opportunity for advancement, whatever may be the individual distaste for change. A successful application may mean an immediate advance in earnings of 50 to 100 per cent. or over. The work costs little beyond the expenditure of spare time which might otherwise be wasted, and a postage bill which is comparatively insignificant. Even if in a large proportion of cases the result is *nil*, this fact will at any rate help to promote a reasonable feeling of satisfaction with the present position: but for the class of employee whose security of tenure is bounded by a possible week's or month's notice, and for whom a change in management, a run of bad trade, or a change of policy entirely beyond his individual control may mean a sudden termination of his engagement, the dictates of commonsense no less than the drive of ambition should urge upon him an intensive study of the qualifications he has to offer in the labour market, how they may be augmented, and how they may be disposed of to the best advantage.

As a result of handling many thousands of applications for positions of all kinds, either for a preliminary or final selection of the candidates, the writer believes there are certain hints on the subject which might be of assistance to a considerable proportion of those who are seeking a change of position.

The Letter.

In the first place, reasonable attention should be given to the selection of the letter paper employed. Coloured notepaper, or paper which is cut and folded into small or fancy shapes is definitely out of place, although it is more frequently used than would be imagined. Any unusual size or shape places a letter at a disadvantage for perusal when it is clipped in a bundle with many others. The most convenient of all is the normal commercial size of letter-paper, measuring about 10 in. × 8 in. upright, with the address plainly indicated at the top.

There is next to be decided the question of length. To attract the favourable notice of an employer who is wading through a large volume of correspondence, is it advisable to make the letter brief or fully explanatory? It is a difficult question to decide, but in the case of the few outstanding applications finally selected as the most suitable undoubtedly it would be preferred that the details given should be as complete as possible But although the outstanding applications are preferred as informative and complete as possible, it must be remembered that of the letters written for any position of consequence more than half run into three or more pages, and there is a consequent temptation merely to skim a large proportion of these rather than read them word by word.

A method which enables the salient points of a lengthy letter to be noted almost as readily as those in a short communication, is to adopt a system of tabulation for setting out many of the essential details. Education, past positions, length of service, professional qualifications or diplomas can all be neatly tabulated in such a manner that the eye can pick out the essential details at a glance, and the adoption of this method makes it permissible for an applicant to enlarge upon other points if it be necessary. In addition to the use of tabulation, the lengthy letter loses much of its drawbacks if the various paragraphs are properly set out with side headings, so as to facilitate still further a rapid grasp of the essential contents.

For anyone who has occasion to handle a large amount of correspondence, there is no need to stress the fact that it is the typewritten communications which invariably receive the first attention, while the hand-written ones are put on one side until later. On the other hand, no one would expect a mechanic or ordinary operative to have at his disposal the facilities of a typewriting office, and in certain other occupations, such for instance as a working storekeeper, a typewritten application is apt to give the impression of clerical rather than practical qualifications.

The Box Number.

The use of the box number system, which is the rule in nine cases out of ten when any situation is advertised, presents certain awkward problems for an applicant. The box number may hide the identity of his present employer; it may be some concern advertising a wholly imaginary position for the purpose of securing from the resulting replies some useful information respecting different competitors' trade in the same line—and it is surprising what an amount of interesting details of this description can be gleaned from a careful study of such letters: or the advertiser may merely be a worker in a somewhat similar position who is desirous of ascertaining in this way the current market value which is placed upon such qualifications as he has to offer by others of approximately equal calibre.

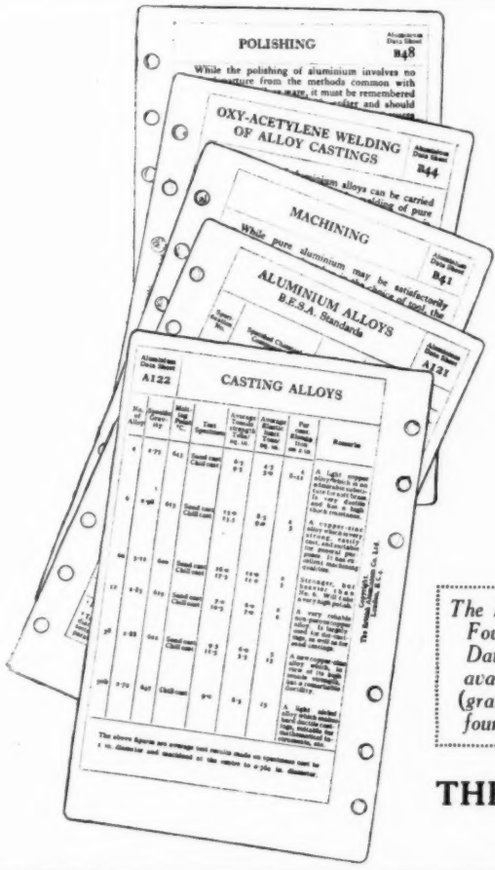
The Unsolicited Application.

A further point which often arises is the relative chance of success of an application written in response to an advertisement and an unsolicited letter addressed to a likely manufacturer asking if a vacancy exists or can be made. The writer's personal experience is that for results both methods are about equal, but each has its peculiar advantages and drawbacks. In the case of the advertised post a vacancy exists, but the application which seeks to secure it has to compete for attention with hundreds of others.

There are a few considerations on the subject which will help to indicate the applicability of either method. In the case of an every-day routine post, it may be taken for granted that if an opening exists it will at once be filled. Against this, there is the possibility that if the works is a large one, and particularly if the establishment is of the type which in America is known as having a "quick labour turnover"—in other words where an individual worker is hardly in before he is out again—an unsolicited application may be preserved by the labour department for reference, especially if there is a regular call for workers of the qualifications indicated. Such considerations apply mainly to positions of a routine character. For the man possessing special or unusual qualifications, the chance of success is often greater with an unsolicited application than with one written in response to an advertisement, as it secures full and uninterrupted attention without the distraction of the competing claims of hundreds of others. It must be borne in mind that a position may sometimes be made for exceptional qualifications or special experience when these can be proved. The case of a successful salesman will of course readily occur as a case in point, but in a varying degree there is always a chance that a position may be made for other classes of executive with any exceptional experience or results to their credit, and in such cases an unsolicited application will receive considerably more attention than if it is merely one of many written in response to an advertisement.

The search for a remunerative position resolves itself very often into the question of salesmanship, of qualifications or personality in a highly competitive market. It is a class of sale which nearly everyone has to negotiate at various periods of their career, from the head of a large undertaking down to the youngest worker, and if a steady progression from position to position of increasing importance is evidence of sterling merit, it also indicates the possession of qualities of salesmanship of a high order. There are few directions in which salesmanship will bring bigger rewards than when its principles are applied to the sale of personal services, and the application which is a sales letter rather than a biography will always secure preference.

F.T.J. 21.4.28



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BRITISH STANDARD alloys, from their inception, have been available as B.A.C. metal, mixed under the same standardized conditions as apply to the Company's older alloys.

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ASH	not exceeding	8%
SULPHUR	,, ,,	0·8%
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MOISTURE	under	1·50%

Trade Talk.

Baldwin's Limited, have decided to restart their steelworks at Landore, after 12 months' idleness, with about 200 men at the end of this week.

Vickers-Armstrongs, Limited, have secured an order from the Bombay Port Trust for a shipshape caisson for the communication passage between Princes and Victoria Docks, Bombay.

The London & North Eastern Railway Company have placed a contract with J. Brown & Company, Limited, for a twin-screw geared turbine passenger steamer of the shelter deck type, with cruiser stern, for the service between Harwich and the Hook of Holland.

T. W. Ward, Limited, of Sheffield, have recently acquired the Lactose Factory and the Sanagen Factory, in Tipperary, and the Dundalk Ironworks, co. Louth. It is understood that negotiations are in progress with a view to re-starting the three factories, but if these fail the inevitable result will be the dismantling of the works.

W. H. A. Robertson & Company, Limited, Lynton Works, Bedford, announce that by their association with the Torrington Manufacturing Company (U.S.A.), they are able to supply the complete range of productions of the Torrington Company, but manufactured at Bedford. These include rolling mills, slitting shears, ingot and strip scaling or overhauling machines, etc.

The Department of Navigation and Ports in Buenos Aires has solicited authority from the Argentine Government to call for tenders for the supply of sleepers for the port lines, and negotiations are in hand for the purchase of 1,000 tons of rails, with the corresponding switch-points and other accessories. It is stated that the rails in question will be supplied by a German firm, which has undertaken to deliver them within two months.

A scheme is under consideration for the concentration of the works of John Baker & Company, Limited, steel and railway material makers, Rotherham, at their newest works at Kilnhurst, South Yorkshire. This would necessitate the closing of two of their establishments at Brinsworth and the Holmes, Rotherham. The company utilise a good deal of electric current for power, and are dissatisfied with the terms upon which they are supplied with electricity by the Corporation of Rotherham.

The Federation of British Industries has issued a précis of a report which has been compiled by the Education Committee of the Federation on the development of educational courses dealing with subjects relating to industrial administration. This report is the outcome of various movements by school authorities to enlarge their syllabuses more adequately to supply the needs of modern industrial requirements. The science of administration is defined as: (*a*) Discovering the best method of carrying out any function concerned with industry; (*b*) ensuring that the method is put into practice. Reference is made to the development in overseas countries, and a review is made of the existing facilities in this country. This review shows that though some of the individual subjects which affect management are being dealt with practically nothing is being done in regard to systematic courses containing the "practice" of management. Some of the main headings which it is proposed should be considered for inclusion in courses on this subject are: legal, financial, labour, technical, publicity, selling, transport and statistics.

Company Meeting.

Beyer, Peacock & Company, Limited.—The annual meeting was held on April 2 in London. Sir Sam Fay, the chairman of the company, presided, and said that in his address last year he outlined the paralysing effect upon output of the general and miners' strikes from May to December, 1926, and informed them that for two months of 1927, owing to difficulties in obtaining material supplies, due to accumulated uncompleted orders on the books of their sub-contractors, they did not steam any locomotives and worked only four days a week with a reduced staff. It was not, therefore, until March, 1927, that normal production was resumed. Fortunately, from then onwards a satisfactory tonnage of work was produced, and at the present time their plant and machinery were fully occupied. To-day their works at Gorton were well worth a visit, and they were able with a certain amount of pride to show their customers the factory in which the locomotives were built. That position they intend to maintain, and if and when they could find improved machinery capable of economical manipulation, they would not hesitate to scrap the old in favour of the new.

Iron and Steel Production.

The National Federation of Iron and Steel Manufacturers report in their Statistical Bulletin for February that the number of furnaces in blast at the end of February remained the same as at the end of January, namely, 148, six furnaces having gone out of blast and six having been blown in during the month. The production of pig-iron in February amounted to 550,800 tons, compared with 560,500 tons in January; allowing for the shorter working month, the daily rate of output in February was slightly higher than in January.

Steel production in February amounted to 764,400 tons; it compared with 626,200 tons in January, and was the highest attained since September last. The increase was partly due to the fact that the January output in Scotland was affected by the New Year holidays.

Returns received from 132 firms employing 87,202 workpeople at the end of February show an increase of 701 compared with January, and a decrease of 2,222 compared with February, 1927. According to returns received from 123 firms employing 110,133 workpeople, the average weekly earnings per head in January amounted to £2 18s. 11d., compared with £2 17s. 11d. in December, 1927.

Personal.

Mr. W. Rutter, ironfounder, has succeeded in winning a seat on the Devonport Board of Guardians.

Mr. Thomas Britten, a director of Crompton Parkinson, Limited, and late general manager of Crompton & Company, has been elected a director of the Buell Combustion Company, Limited.

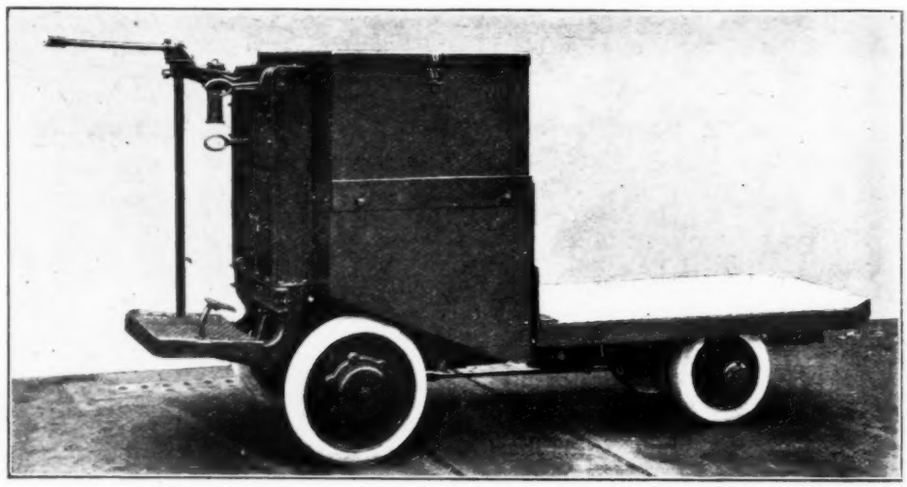
Wills.

Metcalfe, F. E., of The Martins, Linslade, Bucks, retired engineer	£27,732
Ratcliffe, F., Clarence House, Lindum Terrace, Lincoln, engineer and contractor	£23,895
Wadsworth, P. G., of Bella Vista, Penistone, and of Reynolds & Wadsworth, Limited, agricultural engineers, Barnsley	£8,311
Borris, W., of Glenholme, Holbeck Hill, Scarborough, Yorkshire, retired engineer, managing director of Blair & Company, Limited, of Stockton	£54,007
Pontifex, E. L., M.A., Bishopscourt, Broadwater Down, Tunbridge Wells, a Past Master of the Armourers' and Braziers' Company, for 20 years manager of the Briton Ferry Engineering Works, near Swansea	£12,775

Two-Ton Electric Truck with Automatic Elevating Platform.

The electric truck is, one might almost say, an indispensable adjunct to the works, factory and warehouse. It has proved invaluable in saving and speeding up labour. The provision of an elevating platform obviously adds materially to the general utility of a very convenient means of transporting fairly heavy loads.

The truck illustrated, built by Greenwood & Batley, Limited, of Leeds, has a carrying capacity of two tons, and provides a loading space of 5 ft. by 2 ft. 2 ins. in an overall length of 9 ft. 1 in., and overall width of 3 ft. 2 ins.; it is equal to a full-load duty up a gradient of 1 in 7, and has a turning radius of 7 ft. 6 ins.; the normal height of the platform is 10¾ ins., but in a period of 8 secs. it can be raised to a height of 15¾ ins. automatically. It is furnished with four-wheel steering gear. Power transmission is through a nickel-steel worm wheel and phosphor-bronze worm wheel enclosed in a steel case. The brake, of the contracting-shoe type, is Ferodo lined and arranged for foot operation. The motor is of Greenwood & Batley's totally-enclosed special traction type wound for series and parallel control. A revolving drum-type controller gives three speeds in either direction; it is fitted with renewable fingers and contacts interlocked with the brakes and circuit breaker.



Two-Ton Electric Truck with Automatic Elevating Platform.

The elevating gear is driven by a totally-enclosed series reversing motor of 2 b.h.p. The motor is connected by a set of spur reduction gears to a steel main screw with square thread, carried on ball bearings and provided with thrust bearing. A phosphor-bronze nut on the screw actuates a pair of rocking shafts through a pair of steel links and a system of bell-crank levers. Four steel brackets are fixed to the rocking shafts and to the elevating platform, which is raised and lowered by the motion of the shafts. A barrel-type controller starts and reverses the motor by means of a handle worked from the control platform. A limiting device cuts off the current at the extreme stroke of the platform in both directions, and also brings into action a brake on the motor shaft. The battery, the selection of which is left to the customer, is rated at 205-ampere hours' capacity.

In operation the pedal cut-out must be depressed before the circuit is made; the same action releases the brake, and the truck is immovable until this is done. The pedal cut-out being interlocked with the controller, this last must be brought to the neutral position to restart after once stopping. If the driver should stop the truck on top speed, it would be impossible for him to restart the truck until the controller had been put into the neutral position, this ensuring smooth running and preventing all possibility of unduly overloading the motor.

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Iron and Steel Markets.

Pig-Iron.

MIDDLESBROUGH.—During the current week the volume of new business passing in the Cleveland iron market has been on only a restricted scale, but as most of the leading firms of makers are well booked on forward contracts, the present output at furnaces is going promptly into consumption. Indeed, so favourably is the situation regarded that at the Skinningrove Works of Messrs. Pease & Partners an additional blast furnace has been started on Cleveland iron, making five in operation at these works and 38 over the whole area. As regards the export side, shipments increase slowly, but still they do increase, and unless prices abroad suddenly collapse, merchants are hopeful of picking up a few more orders. Prices, both for home consumption or for export, are as follow:—No. 1 Cleveland foundry iron, 68s. 6d.; No. 3 Cleveland G.M.B., 66s.; No. 4 foundry, 65s.; No. 4 forge, 64s. 6d. per ton.

The demand for East Coast hematite continues on a disappointing scale, while prices having reached the lowest basis of concession producers are prepared to accept, a determined effort is being made to stabilise the quotation, which has accordingly been fixed at 70s. per ton for mixed numbers. On the North-West Coast the price of Bessemer mixed numbers also remains stationary at 70s. per ton at works.

LANCASHIRE.—A slightly more hopeful outlook is apparently entertained in the local markets for foundry pig, based, it is reported, on the statement that the total bookings in this area by certain Derbyshire furnaces during the past month were heavier than for several months past, a fact which is somewhat surprising in view of the absence of any marked general buying movement. Prices continue steady at up to 72s. 6d. for Derbyshire No. 3 iron, Staffordshire being offered at round 71s. 6d., Cleveland at 79s., Scottish brands at from 87s. 6d. to 90s., and West Coast hematite at about 84s., all for delivery Manchester or equal.

THE MIDLANDS.—In the absence of any strong buying movement at last week's quarterly meeting of ironmasters, the business passing in foundry pig compared unfavourably in volume with that of previous similar occasions, while the demand indicates little, if any, sign of expansion. Meanwhile prices remain unchanged. Northants, No. 3 is quoted at 58s. to 59s.; Derbyshire, 63s. 6d. to 64s.; and North Staffordshire at 63s. 6d. to 64s., all f.o.t. furnaces. The ironfounders, in the main, are slack, and continue to limit purchases to small lots for current needs. Scotch No. 3 iron is offered delivered locally at about 90s.

SCOTLAND.—The Scotch pig-iron market is feeling the effects of the recent holidays, and business has been exceedingly quiet. There is no change in prices, which continue firm on the basis of 70s. for No. 3 foundry at the furnaces. In several cases there is still an inclination to cover in a little iron based on the view that, whilst prices may not advance, they cannot be cheaper.

Finished Iron.

The quarterly meeting of the iron trade at Birmingham, once an event of the first importance in the industry, was only poorly attended, and the proceedings were without more than passing interest as regards the business transacted. The only noteworthy feature of improvement in finished material was the reduction in price of Staffordshire marked bars from £12 10s. to £12 at makers' works, a movement quite likely to stimulate demand in the near future. There has been no improvement in the demand for crown and cheaper grades of iron, and all the works are keen for new business. The Lancashire makers are cutting the price for crown iron very thin, and are offering it at £9 basis, delivered Black Country. Staffordshire crown iron is quoted at varying prices between £9 5s. and £10. Nut and bolt iron from local mills is quoted at £8 17s. 6d. There is still good business being done by the Continental mills in No. 3 iron for the Darlaston trade. This product is offered at £6 5s. to £6 7s. 6d. delivered.

Scrap.

Very little improvement can as yet be reported in scrap metals, markets mostly remaining in an inactive condition and subject to a slow demand. But, it may be noted, this is usually a period of the year when scrap values usually take an upward turn, and whilst business developments on Tees-side cannot be foretold with mathematical precision, merchants are quite hopeful of an early rise. Meanwhile, in the absence of any real business, quotations are unchanged as follow: Heavy cast-iron ordinary scrap, 62s.; and machinery quality, 66s. In Scotland there is no change in the price of heavy machinery cast-iron scrap suitable for foundries at 70s. per ton, and for ordinary heavy quality 5s. per ton less. Old cast-iron railway chairs are quoted 68s. 6d. to 70s. per ton. Light cast-iron scrap is unchanged at 60s. to 61s. 3d. per ton. The above prices are all per ton delivered f.o.t. consumers' works.

The position in the markets, both for home and export, for British steel may be reported as slowly improving, and at Sheffield inquiries are numerous for Siemens acid billets at £10 per ton, but sales of basic billets have fallen off very badly, the tonnage for delivery in the next month being insufficient to absorb output, notwithstanding the cutting down of production recently. There is a lowering of values in the cheaper grades of high-speed steel to meet Continental competition. The volume of business in stainless steel is expanding, and a better demand for high-class tool steels exists. Continental competition in alloy steels is being felt, and Sheffield prices are being sharply undercut. In the tinplate industry the tendency is rather upward on the increased amount of business coming forward. In fact, there is talk of the minimum being raised very shortly.

Metals.

Copper.—The position in the market for warrant copper continues firm, fluctuations in values from day to day seldom exceeding fractional limits, varying only a few shillings in value. Deliveries into consumption in the past month are said to have been on a very heavy scale, and it is probable that export shipments will also make a good showing. On the other hand, European trade demand, which has been quite good recently, may become less in the near future, pending the results of the general elections in France and Germany.

Official closing prices:—

Cash.—Thursday, £61 12s. 6d. to £61 13s. 9d.; Friday, £61 13s. 9d. to £61 15s.; Monday, £61 12s. 6d. to £61 13s. 9d.; Tuesday, £61 11s. 3d. to £61 12s. 6d.; Wednesday, £61 12s. 6d. to £61 13s. 9d.

Three Months.—Thursday, £61 15s. to £61 16s. 3d.; Friday, £61 15s. to £61 16s. 3d.; Monday, £61 13s. 9d. to £61 15s.; Tuesday, £61 12s. 6d. to £61 13s. 9d.; Wednesday, £61 13s. 9d. to £61 15s.

Tin.—Following the announcement of the March statistics, the cash price was bid up, and also for three months' metal. Dealings at one time were very heavy, but dropped to comparatively small dimensions, and the close was lower. The tendency of prices was very irregular, as reflected in the fact that the premium which existed on cash tin at the outset of 25s. has been turned into a discount. The outlook as regards consumption both in America and on this side is viewed in a more optimistic light, but it is obvious that the total deliveries for last month at 12,083 tons will be followed by more normal returns for April.

Official close:—

Cash.—Thursday, £232 to £232 2s. 6d.; Friday, £230 5s. to £230 10s.; Monday, £231 10s. to £231 12s. 6d.; Tuesday, £234 17s. 6d. to £235 2s. 6d.; Wednesday, £234 15s. to £234 17s. 6d.

Three Months.—Thursday, £232 17s. 6d. to £233; Friday, £231 to £231 5s.; Monday, £232 7s. 6d. to £232 10s.; Tuesday, £235 10s. to £235 15s.; Wednesday, £234 12s. 6d. to £234 17s. 6d.

Spelter.—The demand for ordinary spelter is again inactive, but without any considerable fluctuation in prices. Rudolf Wolff & Company write:—Spelter has remained quietly steady, the price showing little or no change. Consumption is well maintained in this country, and reports from the Continent indicate a continuance of the steady conditions which have hitherto prevailed.

Closing prices:—

Ordinary.—Thursday, £24 16s. 3d.; Friday, £25; Monday, £25 6s. 3d.; Tuesday, £25 10s.; Wednesday, £25 11s. 3d.

Lead.—The market for soft foreign pig continues fairly steady, showing comparatively small change. Reports from America have on the whole been rather more favourable, the price there having been advanced by 10 points, but such demand as might have been induced by this advance was very freely met by sellers.

Closing prices:—

Soft Foreign (Prompt).—Thursday, £20; Friday, £20 1s. 3d.; Monday, £20; Tuesday, £20 1s. 3d.; Wednesday, £20 6s. 3d.

Institute of Metals.

London Local Section.

The annual general meeting of the London Section of the Institute of Metals was held in the rooms of the Society of Motor Manufacturers and Traders, Limited, 83, Pall Mall, S.W.1, on Thursday, April 12. Mr. A. H. Mundey (the retiring chairman) presided.

The secretary's and treasurer's reports for the session 1927-8 were read and approved.

Election of Officers.

The election of officers then took place as follows:—Mr. S. W. Smith, D.Sc., F.I.C., was unanimously elected chairman for the coming session; whilst Mr. W. T. Griffiths, M.Sc., was appointed to fill the joint positions of vice-chairman and hon. secretary. Mr. S. L. Archbutt, F.I.C., was re-elected hon. treasurer. The following Committee was chosen:—Messrs. C. E. Barrs, D. Finlayson, M.C., M.A., B.Sc., Lindridge, G. H. Marks (Associate), C. H. Matthews (Associate), and Miss E. W. Parker (Associate) were re-elected for another session, whilst the two new members appointed were Dr. C. J. Smithells and Mr. Rease (the latter of the Research Department, Woolwich).

The chairman stated that Dr. Rosenhain wished to resign his position on this Committee in view of his appointment as chairman of the parent body and his increased duties as such.

Mr. Clarke proposed a hearty vote of thanks to the retiring chairman and his committee for the excellent work which they had done during the past session. He thought that the annual report spoke for itself in this respect. This was seconded by Mr. S. V. Williams, B.Sc., and carried, Mr. Mundey making a suitable reply.

An interesting Paper was then read by Mr. R. B. Pilcher, entitled "Alchemists in Art and Literature."

Publication Received.

Railhead Storage.—The London, Midland & Scottish Railway Company have just issued an interesting booklet, which draws attention to the facilities offered by this railway for renting office and storage accommodation in the many enormous and widely distributed buildings contiguous to the system. It is convincingly written, well illustrated, and we advise the members of the founding community carefully to consider the potentialities of the service offered.

Magazine of Imperial Chemical Industries.—Staff magazines are playing an important part in creating improved industrial relations between employers and employed. It is estimated that from 250 to 300 firms of all sizes now issue periodicals for circulation among their employees as an official medium for giving information on current happenings both inside the firm and in the industry in which it is engaged. These magazines range in size from eight small pages to 120 large pages. One of the newest is the "I.C.I. Magazine" of Imperial Chemical Industries, Limited. First issued last January, it compares favourably with its contemporaries in point of size and promises to become a valuable adjunct to the advanced labour policy of the Combine. Out of 40,000 workers, 35,000 subscribe to the magazine. The April issue includes a short history of one of the constituent companies, Brunner, Mond & Company, Limited, and gives an interesting account of the foundation 55 years ago of this great British chemical firm. In 1875 there were less than 180 workers on the wage list; the total to-day is little short of 9,000. Other articles in this issue include a description of the large block of offices now being completed at Millbank, Westminster, for the Combine, also semi-technical articles and news from the 36 constituent companies. The magazine has about 100 chief correspondents, these being assisted by some hundreds of departmental correspondents. Imperial Chemical Industries, Limited, is among the first of the great industrial concerns to organise holidays on the Continent for its workers.

Sterling

MOULDING BOXES

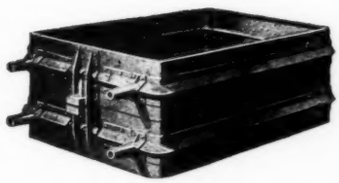
¶ LIGHTNESS AND EASE OF HANDLING;
¶ ROBUST CONSTRUCTION;
¶ DURABILITY AND LONG LIFE;
¶ PERMANENT ACCURACY.

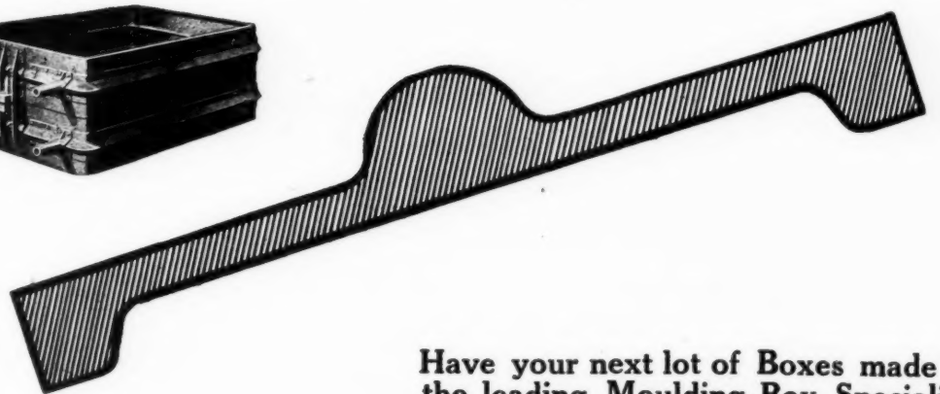
These are the paramount essentials of the modern moulding box.

Sterling Boxes embody all these qualities. They are made from solid ribbed rolled steel of the special section shown below.

Some of the largest and most up-to-date foundries in the country are now completely equipped with Sterling Boxes.

All Sterling Boxes are made to suit the individual requirements of each Foundry. We will drill them to match up to your existing pattern plates or odd-sides and fit them with bars to suit your special patterns.





Have your next lot of Boxes made by the leading Moulding Box Specialists.

STERLING FOUNDRY SPECIALTIES LTD., BEDFORD

London Office:
13, VICTORIA STREET, S.W.1.

Telephone: 3345 BEDFORD.
Telegrams: "STERFLASK, BEDFORD."
Code: WESTERN UNION.

WEEKLY PRICE CURRENT.

COPPER

	£ s. d.
Standard cash	61 12 6
Three months	61 13 9
Electrolytic	66 10 0
Tough	64 5 0
Best selected	64 10 0
Sheets	92 0 0
India	76 0 0
Wire bars	66 15 0
Do. April	66 15 0
Do. May	66 15 0
Ingot bars	66 15 0
H.C. Wire rods	71 10 0
Off. av. cash, March	61 3 6 2/3
Do. 3 mths., March	61 3 0 9/11
Do., Sttlmnt., March	61 3 6 3/11
Do., Electro, March	66 12 2 11/20
Do., B.S., March	65 1 11 1/2
Aver. spot price, copper, Mar.	61 3 7
Do., Wire bars, March	66 15 6 3/4
Solid drawn tubes	13d.
Brazed tubes	13d.
Wire	9 1/8d.

BRASS.

Solid drawn tubes	11 1/2d.
Brazed tubes	13 1/2d.
Rods, drawn	10 1/2d.
Rods, extd. or rlld.	7 1/2d.
Sheets to 10 w.g.	10 1/2d.
Wire	9 1/2d.
Rolled metal	9 1/2d.
Yellow metal rods	7 1/2d.
Do. 4 × 4 Squares	8d.
Do. 4 × 3 Sheets	8 1/2d.

TIN.

	£ s. d.
Standard cash	234 15 0
Three months	234 12 6
English	236 0 0
Bars	238 0 0
Straits	234 10 0
Australian	232 10 0
Eastern	235 17 6
Banca	236 10 0
Off. av. cash, March	232 16 5 1/2
Do., 3 mths., March	234 0 1 1/11
Do., Sttlmt., March	232 15 2 1/11
Aver. spot, March	232 16 5

SPELTER.

	£ s. d.
Ordinary	25 11 3
Remelted	25 0 0
Hard	20 0 0
Electro 99.9	29 0 0
English	25 12 6
India	21 10 0
Zinc dust	33 0 0
Zinc ashes	8 0 0
Off. aver., March	25 0 5 5/8
Aver., spot, March	25 1 7 1/4

LEAD.

	£ s. d.
Soft foreign ppt.	20 6 3
English	21 15 0
Off. average, March	20 2 10 1/2
Average spot, March	19 18 9

ZINC SHEETS, &c.

	£ s. d.
Zinc sheets, English	33 10 0
Do. V.M. ex whf.	32 0 0
Rods	39 0 0
Boiler plates	29 10 0
Battery plates	31 5 0

ANTIMONY.

	£ s. d.
Special brands, Eng.	58 0 0
Chinese	41 10 0
Crude	34 0 0

QUICKSILVER.

	£ s. d.
Quicksilver	22 7 6

FERRO-ALLOYS AND STEEL-MAKING METALS.

Ferro-silicon—	
25%	£8 2 6
45/50%	£12 17 6
75%	£20 10 0
Ferro-vanadium—	
35/40%	14/3 lb. va.
Ferro-molybdenum—	
70/75% c. free	4/8 lb.
Ferro-titanium—	
23/25% carbonless	11d.
Ferro-phosphorus, 20/25%	£17 15 0
Ferro-tungsten—	
80/85%, c. fr.	1/3 1/2 lb.
Tungsten metal powder—	
98/99%	1/7 3/4 lb.
Ferro-chrome—	
2/4% car.	£32 17 6
4/6% car.	£22 7 6
6/8% car.	£22 2 6
8/10% car.	£22 0 0
Ferro-chrome—	
Max. 2% car.	£35 2 6
Max. 1% car	£40 0 0
Max. 0.70% car	£47 0 0
70%, carbonless	1/2 lb
Nickel—99%, cubes or pellets	£175 0 0
Ferro-cobalt	9/6 lb.
Aluminium 98/99%	£105 0 0
Metallic chromium—	
96/98%	2/10 lb.
Ferro-manganese (net)—	
76/80%, loose	£13 10 0
76/80%, packed	£14 10 0
76/80%, export	£13 10 0
Metallic manganese—	
94/96%, carbonless	1/10 lb.

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL.

Finished bars, 14% tungsten	£0 2 3
Finished bars, 18% tungsten	£0 2 9

Per lb. net, d/d buyers' works.

Extras—	
Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under 1/4 in. to 1/8 in.	3d. lb.
Do., under 1/8 in. to 1/16 in.	1/- lb.
Flats, 1/8 in. × 1/4 in. to under 1 in. × 1/8 in.	3d. lb.
Do., under 1/8 in. × 1/4 in.	1/-lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

Scrap from high-speed tool steel—	
Scrap pieces	3d.
Turnings and swarf	1d.

Per lb. net, d/d steel makers' works.

SCRAP.

	£ s. d.
South Wales—	
Hvy. steel	3 5 0
Bundled steel and shrngs.	2 16 6 to 3 2 6
Mixed iron and steel	2 17 0 to 2 18 0
Heavy cast iron	2 18 0 to 3 0 0
Good machinery for foundries	3 2 6 to 3 7 6
Cleveland—	
Heavy steel	2 17 0
Steel turnings	2 9 0
Cast iron borings	2 3 0
Heavy forge	3 10 0
Bushelled scrap	3 2 6
Cast-iron scrap	3 2 0 to 3 6 0
Lancashire—	
Cast-iron scrap	3 5 0
Hvy. wrought	3 2 6
Steel turnings	2 2 6
London—Merchants' buying prices delivered yard.	
Copper (clean)	52 0 0
Brass (clean)	38 0 0
Lead (less usual draft)	17 10 0
Tea lead	15 10 0
Zinc	16 0 0
New aluminium cuttings	75 0 0
Braziery copper	47 0 0
Gunmetal	48 0 0
Hollow pewter	165 0 0
Shaped black pewter	125 0 0

PIG-IRON.

(f.o.t. unless otherwise stated.)

N.E. Coast—	
Foundry No. 1	68/6
Foundry No. 3	66/-
Foundry No. 4	65/-
Forge No. 4	64/6
Hematite No. 1	70/6
Hematite M/Nos.	70/-
N.W. Coast—	
Hem. M/Nos. d/d Glas.	82/6
,, d/d Birm.	87/6
Midlands—	
Staffs. common*	—
,, No. 4 forge	62/6
,, No. 3 fdry.	64/6
Shrops. basic	—
,, Cold blast, ord.*	155/-
,, ,, roll iron*	—
* d/d Birmingham.	
Northants forge	—
,, fdry. No. 3	58/6 to 59/-
Derbyshire forge	60/-
,, fdry. No. 3	64/-
,, basic	—
Scotland—	
Foundry No. 1	—
,, No. 3	70/-
Hem. M/Nos.	75/-
Sheffield (d/d district)—	
Derby forge	64/6
,, fdry. No. 3	67/6
Lincs. forge	63/6
,, fdry. No. 3	67/-
E.C. hematite	82/6
W.C. hematite	85/-
Lincs. (at furnaces)—	
Forge No. 4	63/6
Foundry No. 3	67/-
Basic	66/-
Lancashire (d/d eq. Man.)—	
Derby forge	—
,, fdry. No. 3	72/3
Northants foundry No. 3	58/6
Dalzell, No. 3	100/- to 102/6
Summerlee, No. 3	86/6 to 94/-
Glengarnock, No. 3	86/6 to 94/-
Gartsherrie, No. 3	86/6 to 94/-
Monkland, No. 3	86/6 to 94/-
Coltness, No. 3	86/6 to 94/-
Shotts, No. 3	86/6 to 94/-

FINISHED IRON AND STEEL.

Usual District deliveries for iron; delivered consumers' station for steel.

Iron—	£ s. d.	£ s. d.
Bars (cr.) nom.	9 0 0	to 10 10 0
Angles		—
Tees to 3 united ins.		—
Nut and bolt iron		8 17 6
Hoops		12 0 0
Marked bars (Staffs.) f.o.t.		12 0 0
Gas strip		11 10 0
Bolts and nuts, 3/4 in. × 4 in.		15 5 0
Steel—		
Ship plates	8 7 6	to 8 12 6
Boiler plts.		10 10 0
Chequer plts.		10 5 0
Angles		7 17 6
Tees		8 17 6
Joists		7 17 6
Rounds and squares, 3 in. to 5 1/2 in.		7 10 0
Rounds under 3 in. to 1/4 in. (Untested)		7 15 0 and upwards
Flats, over 5 in. wide and up		8 17 6
Flats, 5 in. to 1 1/2 in.		7 17 6
Rails, heavy	8 2 6	to 8 10 0
Fishplates		12 10 0
Hoops (Staffs.)		10 10 0
Black sheets, 24g.		10 0 0
Galv. cor. shts., 24g.		13 2 6
Galv. fencing wire 8g. plain		12 10 0
Billets, soft	£6 0 0	to 6 10 0
Billets, hard	£7 2 6	to 7 12 6
Sheet bars	£5 12 6	to 5 15 0
Tin bars	£5 12 6	to 5 15 0

PHOSPHOR BRONZE.

	Per lb. basis.
Strip	1 2 1/2
Sheet to 10 w.g.	1 3
Wire	1 3 1/4
Rods	1 3
Tubes	1 8 1/2
Castings	1 2

Delivery 3 cwt. free.
10% phos. cop. £40 above B.S.
15% phos. cop. £50 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. Clifford & Son, Limited.

NICKEL SILVER, &c.

	per lb.
Ingots for raising	9d. to 1/3
Rolled—	
To 9 in. wide	1/3 to 1/9
To 12 in. wide	1/3 1/2 to 1/9 1/2
To 15 in. wide	1/3 1/2 to 1/9 1/2
To 18 in. wide	1/4 to 1/10
To 21 in. wide	1/4 1/2 to 1/10 1/2
To 25 in. wide	1/5 to 1/11
Ingots for spoons and forks	9d. to 1/5 1/2
Ingots rolled to spoon size	1/- to 1/8 1/2
Wire round—	
3/0 to 10 G.	1/6 1/2 to 2/1 1/2

with extras according to gauge.

AMERICAN IRON AND STEEL.

At Pittsburgh unless otherwise stated.

	Dols.
No. 2X foundry, Phila.	20.76
No. 2 foundry, Valley	17.25
No. 2 foundry, Birm.	16.00
Basic	18.76
Bessemer	19.26
Malleable	19.01
Grey forge	18.51
Ferro-mang. 80% d/d	100.00
O.-h. rails, h'y at mill	43.00
Bess billets	33.00
O.-h. billets	33.00
O.-h. sheet bars	34.00
Wire rods	44.00
	Cents.
Iron bars, Phila.	2.12
Steel bars	1.85
Tank plates	1.85
Beams, etc.	1.85
Skelp, grooved steel	1.85
Skelp, sheared steel	1.85
Steel hoops	2.20
Sheets, black, No. 24	2.85
Sheets, galv., No. 24	3.65
Sheets, blue an'l'd., 9 and 10	2.10
Wire nails	2.65
Plain wire	2.50
Barbed wire, galv.	3.35
Tinplate, 100 lb. box	$5.25

COKE (at ovens).

Welsh foundry	—
,, furnace	—
Durham and North.	
,, foundry	—
,, furnace	14/-
Other Districts, foundry	—
,, ,, furnace (basis)	12/- to 13/-

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. Cokes	20×14	box	18/1 1/2
,,	28×20	,,	36/3
,,	20×10	,,	—
,,	18 3/4×14	,,	—
C.W.	20×14	,,	17/-
,,	28×20	,,	—
,,	20×10	,,	—
,,	18 3/4×14	,,	—
Terneplates	28×20	—	per box basis f.o.b.

SWEDISH IRON.

Bars, hammered, £17 10 0	to £18 10 0
Rolled Ord. £15 0 0	to £15 10 0
Nail rods £15 7 6	to £15 15 0
Keg. steel nom.	£33 to £35
Faggot steel nom.	£22 to £25
Blooms, according to quality	£8 to £12
Pig-iron £5 15 0	to all f.o.b. Gothenburg.

TUBES AND FITTINGS.

Up to and incl. 6 in.

	Tubes.	*Fittings.*
Gas	67½% ..	.. 45%
Water	63¾% ..	.. 40%
Steam	60% ..	.. 35%

W.I. 10% extra.

DAILY FLUCTUATIONS.

Standard Copper (cash).

	£	s.	d.		
April 12 ..	61	12	6	dec.	1/3
,, 13 ..	61	13	9	inc.	1/3
,, 16 ..	61	12	6	dec.	1/3
,, 17 ..	61	11	3	,,	1/3
,, 18 ..	61	12	6	inc.	1/3

Electrolytic Copper.

	£	s.	d.		
April 12 ..	66	10	0	No change	
,, 13 ..	66	10	0	,,	,,
,, 16 ..	66	10	0	,,	,,
,, 17 ..	66	10	0	,,	,,
,, 18 ..	66	10	0	,,	,,

Standard Tin (cash).

	£	s.	d.		
April 12 ..	232	0	0	inc.	27/6
,, 13 ..	230	5	0	dec.	45/-
,, 16 ..	231	10	0	inc.	25/-
,, 17 ..	234	17	6	,,	77/6
,, 18 ..	234	15	0	dec.	2/6

Tin (English ingots).

	£	s.	d.		
April 12 ..	237	0	0	inc.	25/-
,, 13 ..	235	10	0	dec.	30/-
,, 16 ..	236	10	0	inc.	20/-
,, 17 ..	236	10	0	No change	
,, 18 ..	236	0	0	dec.	10/-

Zinc Sheets (English).

	£	s.	d.		
April 12 ..	33	10	0	No change	
,, 13 ..	33	10	0	,,	,,
,, 16 ..	33	10	0	,,	,,
,, 17 ..	33	10	0	,,	,,
,, 18 ..	33	10	0	,,	,,

Spelter (ordinary).

	£	s.	d.		
April 12 ..	24	16	3	inc.	1/3
,, 13 ..	25	0	0	,,	3/9
,, 16 ..	25	6	3	,,	6/3
,, 17 ..	25	10	0	,,	3/9
,, 18 ..	25	11	3	inc.	1/3

Lead (English).

	£	s.	d.	
April 12 ..	21	10	0	No change
,, 13 ..	21	10	0	,, ,,
,, 16 ..	21	10	0	,, ,,
,, 17 ..	21	10	0	,, ,,
,, 18 ..	21	10	0	,, ,,

AVERAGE MONTHLY PRICES OF DERBYSHIRE NO. 3 FOUNDRY AT MANCHESTER.

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly average
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1895 ..	2 3 0	2 3 0	2 2 6	2 2 6	2 2 6	2 4 0	2 3 6	2 4 0	2 5 0	2 5 6	2 6 6	2 5 6	2 3 11½
1896 ..	2 5 6	2 6 0	2 6 0	2 6 0	2 6 0	2 5 6	2 5 0	2 5 0	2 5 0	2 6 0	2 7 0	2 8 6	2 5 11½
1897 ..	2 10 0	2 11 0	2 9 0	2 8 6	2 8 0	2 7 0	2 7 0	2 7 0	2 6 0	2 6 0	2 6 6	2 7 6	2 7 9½
1898 ..	2 7 6	2 8 0	2 8 0	2 8 0	2 8 6	2 10 0	2 10 0	2 10 0	2 9 0	2 11 0	2 14 0	2 14 0	2 9 11
1899 ..	2 13 0	2 14 0	2 14 0	2 14 0	3 0 0	3 2 0	3 13 0	3 16 6	3 15 0	3 16 6	3 16 6	4 0 0	3 6 2½
1900 ..	4 0 0	4 0 0	4 0 0	4 1 6	4 1 0	3 18 0	3 13 6	3 12 6	3 11 0	3 11 0	3 9 6	3 8 0	3 15 5
1901 ..	2 13 6	2 17 0	2 15 0	2 15 0	2 14 0	2 13 9	2 13 6	2 13 6	2 14 6	2 13 0	2 12 6	2 16 6	2 14 3½
1902 ..	2 17 6	2 17 6	2 15 6	2 16 9	2 16 6	2 16 6	2 16 6	2 17 0	2 18 6	2 18 6	2 17 6	2 17 6	2 17 1½
1903 ..	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6
1904 ..	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6
1905 ..	2 13 0	2 13 0	2 11 6	2 12 6	2 12 0	2 12 0	2 12 3	2 12 3	2 14 0	2 16 6	3 0 0	3 0 6	2 14 1
1906 ..	3 2 0	3 5 0	3 3 0	3 0 6	2 17 0	2 18 6	2 18 0	2 16 6	2 19 0	3 0 6	3 1 6	3 7 0	3 0 8½
1907 ..	3 7 0	3 7 0	3 5 0	3 2 0	3 4 0	3 8 0	3 6 0	3 5 0	3 4 0	3 2 6	3 1 0	2 18 6	3 4 2
1908 ..	2 15 0	2 14 6	2 14 6	2 15 6	2 14 0	2 13 0	2 13 0	2 11 6	2 12 6	2 13 0	2 12 6	2 12 6	2 13 5½
1909 ..	2 13 0	2 12 6	2 11 6	2 12 0	2 12 6	2 12 6	2 12 0	2 12 6	2 14 6	2 15 0	2 14 6	2 14 0	2 13 0½
1910 ..	2 13 9	2 14 0	2 14 0	2 14 4	2 15 0	2 15 0	2 14 9	2 15 0	2 15 0	2 15 0	2 15 0	2 15 0	2 14 7½
1911 ..	2 16 0	2 16 0	2 16 0	2 16 0	2 16 0	2 16 0	2 16 0	2 16 0	2 16 0	2 14 6	2 15 0	2 15 0	2 15 8½
1912 ..	2 17 4½	2 17 6	2 17 6	3 1 1½	3 2 6	3 3 9	3 6 3	3 7 6	3 10 10½	3 12 6	3 13 3½	3 14 6	3 5 4
1913 ..	3 15 7	3 15 0	3 11 10½	3 11 4½	3 10 2½	3 6 10½	3 4 2½	3 2 9	3 1 9	3 1 0	2 19 3	2 17 2½	3 6 5
1914 ..	2 17 2½	2 18 0	2 18 0	2 17 0	2 17 0	2 16 7½	2 16 0	3 2 10	3 1 0	2 19 9½	2 16 11½	2 18 1½	2 18 2½
1915 ..	3 1 2	3 3 11	3 5 9	3 18 8½	3 13 7	3 14 1	3 15 0	3 13 3	3 12 0½	3 11 1	3 14 0	4 3 3	3 12 2½
1916 ..	4 4 6½	4 11 6	4 11 6½	4 7 6	4 7 6	4 7 6	4 10 0	4 12 10	4 12 6	4 12 6	4 12 6	4 12 6	4 8 6½
1917 ..	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6
1918 ..	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6
1919 ..	4 12 6	4 12 6	4 12 6	4 12 6	7 2 6	7 5 0	8 8 5	9 0 0	9 0 0	9 0 0	9 0 0	9 0 0	7 3 10
1920 ..	9 13 9	10 0 0	10 5 3	10 15 3	11 10 0	12 2 6	12 5 0	13 1 3	14 7 6	14 5 0	14 5 0	14 5 0	12 12 1½
1921 ..	12 11 8	10 8 9	9 2 6	8 2 0	8 0 0	8 0 0	8 1 8	7 4 0	6 7 6	5 7 6	4 16 10	8 0 2	
1922 ..	5 5 0	4 17 6	4 15 0	4 15 0	4 12 6	4 12 6	4 12 6	4 12 6	4 11 3	4 10 0	4 10 0	4 10 9	4 13 7½
1923 ..	4 12 8½	5 0 2	6 2 6	6 8 7½	6 2 5	5 11 9	5 9 1½	5 4 0	5 0 0	5 0 9	5 0 7	5 2 9	5 7 11½
1924 ..	5 3 0	5 3 0	5 3 0	5 3 0	5 2 10	5 1 3	4 17 11	4 15 6	4 13 6	4 10 1½	4 10 0	4 10 3	4 17 9½
1925 ..	4 10 0	4 9 0	4 6 9	4 5 2½	4 3 0	4 0 1½	4 17 1½	3 15 7½	3 14 3½	3 13 4½	3 13 4½	3 13 2½	4 1 9
1926 ..	3 14 9	3 15 3	3 15 6	3 15 3½	3 17 6	4 5 9	4 16 9	*	*	*	*	4 12 6	4 0 1½
1927 ..	4 13 9½	4 13 3	4 11 1½	4 9 4½	4 6 1½	3 19 1½	3 16 1½	3 15 6	3 13 4½	3 13 4½	3 14 0	3 13 6½	4 1 6½
1928 ..	3 13 2½	3 12 3½	3 12 3	3 12 3	—	—	—	—	—	—	—	—	—

* No prices available during strike period.

WILLIAM JACKS & COMPANY,

WINCHESTER HOUSE, OLD BROAD ST., LONDON, E.C.2.

18, BENNETTS HILL, BIRMINGHAM.

PIG IRON

REGISTERED TRADE MARK

SCOTCH, MIDDLESBRO', HEMATITE, BASIC, SPECIALS, &c.

NON-FERROUS METALS

COPPER, TIN, LEAD, SPELTER, ANTIMONY, CHROME ORE.

WILLIAM JACKS & COMPANY,

19, ST. VINCENT PLACE, GLASGOW.

ZETLAND ROAD, MIDDLESBROUGH.

SMALL ADVERTISEMENTS.

Notice.

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(A remittance should accompany instructions.)

SITUATIONS VACANT AND WANTED.

ENERGETIC YOUNG MAN, thoroughly conversant with all branches of Foundry work, desires change; experience includes several years in Marine and Jobbing Foundry; present controlling Brass, Iron and Pattern Shops abroad; A.M.I.B.F. and A.M.B.C.I.R.A; highest references.—Box 678, Offices of The Foundry Trade Journal, 49, Wellington Street, Strand, London, W.C.2.

FOREMAN MOULDER wanted for Foundry making castings in dry sand and loam up to 30 tons for reciprocating, turbine and Diesel engines; must be conversant with modern Foundry methods and able to organise and control labour. State age, experience, references and salary required.—Box 690, Offices of The Foundry Trade Journal, 49, Wellington Street, Strand, London, W.C.2.

PRACTICAL FOUNDRYMAN, age 34 (leading hand with engineering firm in Yorkshire), desires position as Foreman or Assistant; working not objected to; well trained in all branches of the trade, including cupola practice; Marine, General Engineering or Jobbing preferred; good references.—Box 684, Offices of The Foundry Trade Journal, 49, Wellington Street, Strand, London, W.C.2.

AGENCY.

LIVE AGENTS required in all districts to handle Core Oils and Creams; good terms offered to suitable men; excellent opportunity for men with Foundry knowledge.—Box 686, Offices of The Foundry Trade Journal, 49, Wellington Street, Strand, London, W.C.2.

PROPERTY.

11 ACRES WORKS SITE, SHEFFIELD.

145,000 Sq. Ft. of SHOPPING, Compact and Convenient.

SIDING CONNECTIONS
with L.M. & S. and L. & N.E. Rlys.

WELL-BUILT & COMMODIOUS OFFICES

Will Sell whole or in lots to suit customers, or Let on favourable terms. Unique opportunity for Manufacturers.

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